The Communicator

May—June 2022

AGM Edition

SARC

the Bi-monthly Periodical from Surrey Amateur Radio Communications

PUBLICATION CONTACTS

COMMUNICATOR & BLOG EDITOR John Schouten VE7TI
communicator at ve7sar.net

SARC TELEPHONE (604) 802-1825

CORRESPONDENCE 12144 - 57A Avenue
Surrey, BC V3X 2S3
SARC at ve7sar.net

CONTRIBUTING EDITORS John Brodie VA7XB
Kevin McQuiggin VE7ZD/KN7Q

Issues appear bi-monthly, on odd-numbered months, for area Amateur Radio operators and beyond, to enhance the exchange of information and to promote ham radio activity.

During non-publication months we encourage you to visit the Digital Communicator at **ve7sar.blogspot.ca**, which includes recent news, past issues of ***The Communicator***, our history, photos, videos and other information.

To subscribe, unsubscribe or change your address for e-mail delivery of this electronic magazine, notify **communicator @ ve7sar.net**

If you find ***The Communicator*** worthwhile, regular readers who are not SARC members are invited to contribute a $5 annual donation towards our Field Day fund via PayPal.

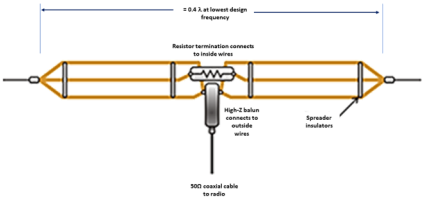
SARC maintains a website at **www.ve7sar.net**

DEPARTMENTS

IN THIS ISSUE

Radio Ramblings
—Antenna Upgrade

The T3FD HF Antenna



All about connectors

...and so much more!

QRM -- -.- .-. --

...from the Editor's Shack

Do you have a photo or bit of Ham news to share? An Interesting link?

Something to sell or something you are looking for?
*eMail it to **communicator at ve7sar.net** for inclusion in this publication.*

Our contributors have another full issue for you. Here at SARC-SEPAR we are busily preparing for what we hope will be a great Field Day and celebrating a return to (almost) normal club operations.

Our numbers for our Saturday morning coffee klatches are increasing as well, and much more than just Amateur Radio is actively discussed. Of course our hobby still takes precedence in these informal meetings and many have been helped resolving their various operational and technical challenges.

Our station is ever growing with the addition of a new Kenwood 220 MHz transceiver and the anticipated arrival of our iCom IC-9700 in the coming weeks. The station will then be fully equipped with two HF positions and full VHF-UHF capability.

We appreciate your continued feedback. None so far has been negative so we take that as a sign that we are providing what you require.

A reader has suggested that we add a column of Amateur Radio experiences in other countries. That is a great idea but we need the input from some of the readers in the more than 140 countries that now receive this publication. If you are a ham in a country outside Canada or the United States, and are so inclined, we would appreciate a story of Amateur Radio at your location. If you worry that knowledge of English is a challenge, no worries, we can edit if necessary.

Enjoy this issue, good luck on Field Day and we'll see you again in July.

73,

~ John VE7TI, Editor
communicator@ve7sar.net

This Month's Cover...

Another great issue for you, thanks to our contributors. This time there are articles on antennas, tuners, VHF, hardware and much more. The photo was taken 'pre-COVID', at our Fox Hunt in 2019. Les Tocko VA7OM is demonstrating the very successful 80m receiver that he developed.

"Imagination is more important than knowledge" *-Albert Einstein*

On the Web

ve7sar.net

Between Communicators, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

Click the links below to follow our presence on the web and social media:

SARC Blog
ve7sar.blogspot.ca

Twitter
@ve7sar

FaceBook
SurreyAmateurRadio

Our YouTube Channel
SurreyARC

SARC Photo Albums
Web Albums
or
tinyurl.com/SARCphoto

The Rest Of The Story...

SSB developer looking past the horizon

Dawn Levy et al

Oswald Garrison Villard Jr. W1DMV/W6QYT

Oswald Garrison "Mike" Villard Jr., was a professor emeritus of electrical engineering and electronics pioneer in radio and radar.

Villard was born Sept. 17, 1916, in Dobbs Ferry, N.Y., to a distinguished family with a long tradition of activism. His great-grandfather, William Lloyd Garrison, was a renowned abolitionist. His grandfather, Henry Villard, also wrote newspaper articles opposing slavery and financed railroads and the work of Thomas Edison. Through his business dealings, he gained a controlling interest in the New York Evening Post and The Nation, which his son, Oswald Garrison Villard Sr., took over upon his death. The senior Villard left The Nation in 1940 when the liberal magazine abandoned its stance against America entering World War II. The junior Villard, whose research eventually earned the highest civilian honor bestowed by the Air Force, described his politics in a 1976 interview with the San Jose Mercury News: "I certainly agreed with my father's viewpoints about peace and mutual disarmament, but I couldn't see unilateral disarmament. He kind of said, 'Let them come in, it's not the worst thing.' I've gone the other way: Keep your powder dry."

He became interested in electricity after he was given "Harper's Electricity Book for Boys"; when he was 12, the family chauffeur gave him a radio assembled from a kit.

Academic career

He initially attended Buckley School in New York City, and later went to The Hotchkiss School in Lakeville, Connecticut. Villard received his bachelor's degree in English literature from Yale University in 1938, and entered Stanford as a graduate student in electrical engineering. In between his degrees, Villard worked first as a research associate 1939-1941 and instructor 1941-1942 under Professor Frederick Terman at Stanford, then at Harvard University's Radio Research Laboratory, designing electronic countermeasures; he also worked with William Hewlett during this time. After World War II interrupted, he returned to Stanford in 1947 and received his doctorate in 1949.

By 1955, he was a full professor at Stanford, a position which he held until retirement in 1987. His Ph.D. students included Mac Van Valkenburg and Kung Chie Yeh.

In 1947, one of his first inventions was a radio transmitter that allowed simultaneous two-way communication (such as in a phone conversation).

At Stanford, Villard used radar to study electrical disturbances in the upper atmosphere caused by meteor trails, nuclear explosions, and rocket launches. His most famous work may be his 1959 efforts in over-the-horizon radar, which worked by reflecting high-frequency radar from the ionosphere.

In 1969, when Stanford University ceased classified work due to student protests, Villard moved his group to Stanford Research Institute (SRI), where he developed stealth technologies to counteract radar and sonar. In the 1980s, he developed small antennas that could receive jammed transmissions, allowing many people to receive the Voice of America radio program, especially after the Tiananmen Square protests of 1989. After his official retirement in 1987, he continued to assist with students' doctoral degrees at Stanford and worked part-time at SRI.

Villard taught at Stanford for five decades and directed STARLab's predecessor, the RadioScience Laboratory, from 1958 to 1972. His initial work used radar to study electrical disturbances in the upper atmosphere caused by meteor trails, nuclear explosions and rocket launches. By reflecting radio waves from meteor trails, he became the first U.S. scientist to "hear" meteors in 1945. His "radio camera" clocked a 1948 Perseid meteor shower at 133,200 miles per hour.

"His technical achievements were legendary," said David B. Leeson, a consulting professor of electrical engineering in Stanford's Space, Telecommunications and Radio-science Laboratory (STARLab). "Stanford and the entire engineering community were enriched by his person and his accomplishments."

"One of Mike's biggest accomplishments was the development of over-the-horizon radar," said Antony Fraser-Smith, research professor emeritus of electrical engineering and of geophysics. "He started this work at Stanford and then it was transferred to [Stanford Research Institute] when it became clear that it had important practical defense applications."

By bouncing high-frequency radar signals off the ionosphere, an electrically charged layer about 50 miles above the Earth's surface, Villard by 1959 had transcended the limitations of line-of-sight radar, which could only "see" as far as the horizon. The over-the-horizon radar he pioneered could instead peer around the Earth's curvature to detect aircraft and missiles launched from thousands of miles away.

It didn't take long for this research to become classified. When Stanford ceased all classified work in 1969 in response to anti-war protests, Villard moved his group to Stanford Research Institute (now SRI International) in Menlo Park.

W6YX QSL card c. late 1930's.

Transmitter: 250THs modulated; 1 kilowatt on all bands. Receivers: RME 69, National HRO. Antennas: Two reversable rhombics, one Sterba array, two 160 meter half-waves.

Left: Cameron G. Pierce, W6HJT, Trustee.
Right: Oswald G. Villard, Jr., W1DMV, Pres.

On the night of September 21, 1947, bizarre sounding voices appeared on the 75 -meter phone band.

There he also developed "stealth" technologies to cancel target return signals from radar and sonar to thwart detection of aircraft and submarines.

As an undergraduate at Yale, where he received a bachelor's degree in English literature in 1938, Villard made history by broadcasting, over a radio transmitter he built, a football game from the stadium back to his dormitory. To the dismay of his father, who had hoped he would go into journalism, when Villard won two composition prizes, he chose to spend the money only on engineering books.

One was written by Stanford electrical engineering Professor Frederick E. Terman, who would later come to be regarded as the "father" of Silicon Valley. When Villard told his father that he wanted to study under Terman, the elder's response was "What? Stanford? That hotbed of Republicanism?" But Villard's father relented after meeting Terman during a visit by the professor to the East Coast.

At Stanford, Varian brothers Russell and Sigurd, David Packard and William Hewlett, William Webster Hansen and other luminaries took Villard under their wings as he pursued his graduate degree in engineering. In turn, Villard aided them as they developed the klystron tube, the basis of radar.

In Stanford's Department of Electrical Engineering, Villard was a research associate from 1939 to 1941 and an instructor from 1941 to 1942. During the war, Terman hired him and others to join the Radio Research Laboratory at Harvard, where they engineered countermeasures to protect Allied forces against enemy radio and radar devices. Villard participated in pioneering studies of radar jamming.

In 1943, he received his Engineer degree from Stanford.

In 1946 he returned to Stanford, where he joined the faculty and married Barbara Letts, whom he had met at a dance at Mills College.

On the night of September 21, 1947, bizarre sounding voices appeared on the 75 -meter phone band. These strange signals were audible in California and adjacent states. In fact, they came, not from outer space as some might have thought, but from W6YX , the club station of Stanford University, operated by O. G. Villard, Jr., W6QYT.

No doubt there were listeners out there who could not believe their ears. But what they were hearing was actually single Sideband modulation. This event represented the beginning of the postwar SSB revolution in amateur radio. It was the most important technical development to hit the hobby since spark gave way to CW. As we have seen, its implications have gone far beyond the technical.

We all owe Villard and his co-experimenters a debt of thanks for bringing us SSB when they did. However, it’s worth knowing that single sideband had already been around for over thirty years. And, not only that, hams had been on the air with the squawky stuff as early as 1933.

His introduction of single-sideband modulation increased the number of stations that can operate without interference and allowed military users, and later police, pilots and radio amateurs, to have their own means of communication. Previously, single-sideband modulation, because of its complexity, had been used only in commercial point-to-point radio

stations. W6YX, the station of Stanford's radio club, became the first amateur group to use single-sideband transmission.

Villard received his doctorate from Stanford in 1949 and rose through the faculty ranks to full professor in 1955. He continued to shepherd students to their doctoral degrees in radio-science even after his official retirement in 1987. He also continued to work part time at SRI.

In the 1980s, Villard designed an inconspicuous antenna that could null out signals that jammed communications, allowing people in oppressed countries to receive Voice of America radio programs despite the efforts by their governments to block them. The antenna could be concealed in a newspaper if a listener were in danger of being caught in the process of receiving broadcasts despite the high-power jamming prevalent in Eastern Bloc countries, Leeson said.

Later, Villard, who filled the backyard of his Woodside home with antennas he built, received requests for his antenna design from Chinese outraged by the student

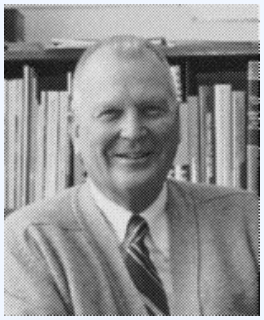
W6YX Celebrates 60th Anniversary of the First Amateur Radio Single Side Band QSO

The October 2007 edition of QST, the monthly publication of the American Radio Relay League, notes that September 21, 2007 was the sixtieth anniversary of the first amateur radio single side band transmission.

The contact was made by W6YX and W0TQK in 1947. The mode was championed by Stanford University researcher and author Oswald Garrison "Mike" Villard Jr, W6QYT, but it was just one of his many accomplishments. During his career at Stanford (and later at Stanford Research Institute--SRI), Villard pioneered the concept and development of a program to design and build an over-the-horizon radar system to detect incoming military aircraft and high-altitude missiles. In addition, he demonstrated the feasibility of the "stealth aircraft" concept by using specially treated low-impedance surfaces. For those achievements he received the Department of Defense civilian Medal of Honor.

Another accomplishment was the design of a simple, small high-frequency receiving antenna that aided in nulling out signals that jammed broadcasts of the Voice of America, the BBC and others.

While a student at Stanford, Villlard served as president of the Amateur Radio Club, and from the 1950s through the early 1980s he was the trustee of W6YX. For a picture of him (then W1DMV) operating W6YX in the late 1930's as student president of the club, see the **history** section. An ARRL member for many years, Villard was also a past scientific advisor to the Northern California DX Foundation.



Mike Villard W6QYT

His biggest hobby was ham radio... He instigated amateur radio satellite systems and frequently published in QST...

massacre at Tiananmen Square. Chinese students in America translated his antenna design into Cantonese.

Author of more than 60 technical papers and holder of six patents, Villard was a member of the National Academy of Sciences, the National Academy of Engineering and the International Scientific Radio Union. He was a fellow of the Institute of Electrical and Electronics Engineers (IEEE), the American Association for the Advancement of Science, the American Academy of Arts and Sciences and SRI. In 1998, Villard was elected to SRI's Alumni Hall of Fame.

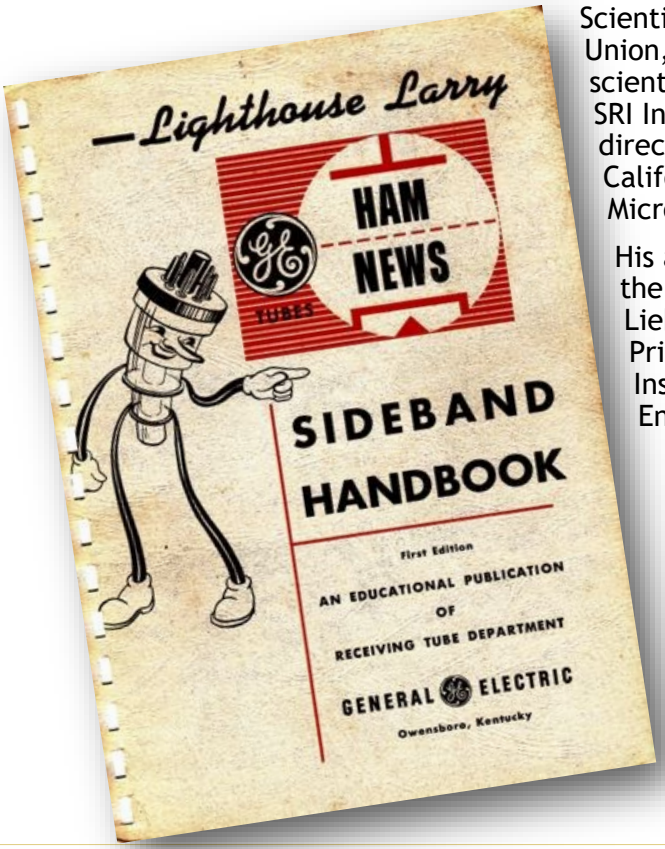
He served as a member on the Air Force Scientific Advisory Board (1961-75) and the Naval Research Advisory Committee (1967-75), which he chaired from 1973 to 1975. He served as chair of the USA Commission III of the International Scientific Radio Union, a senior scientific adviser to SRI International and director of California Microwave Inc.

His awards include the Morris Liebman Memorial Prize from the Institute of Radio Engineers, Outstanding Young Bay Area Engineer, Meritorious Civilian Service Award from the Department of the Air Force, Secretary of Defense Medal for Outstanding Public Service and the IEEE Centennial Medal.

"His biggest hobby was ham radio," recalled Fraser-Smith. Villard, whose call letters were W6QYT, was a faculty adviser to the Stanford Amateur Radio Club and a license trustee of W6YX from the early 1950s to the early 1980s. He instigated amateur radio satellite systems and frequently published in QST, the journal of the American Radio Relay League, the official ham radio society in the United States. Ham radio operators sometimes helped Villard with his research. One experiment solicited hams to participate in a contest that allowed Villard to detect invisible clouds affecting radio wave transmission.

Leeson, who called Villard "one of the most gentle, supportive people I've ever known," recalled an airplane flight from San Francisco to Washington, D.C., when Villard learned that Leeson hoped to form a new company. "He wrote me a blank check right there on the plane! He was a supportive board member of the resulting company, California Microwave."

~



- Villard Jr 1948 A High-Level SSB Transmitter.pdf (one-electron.com)
- Introduction to single sideband [video]

Thoughts from the Shack

John Schouten VE7TI

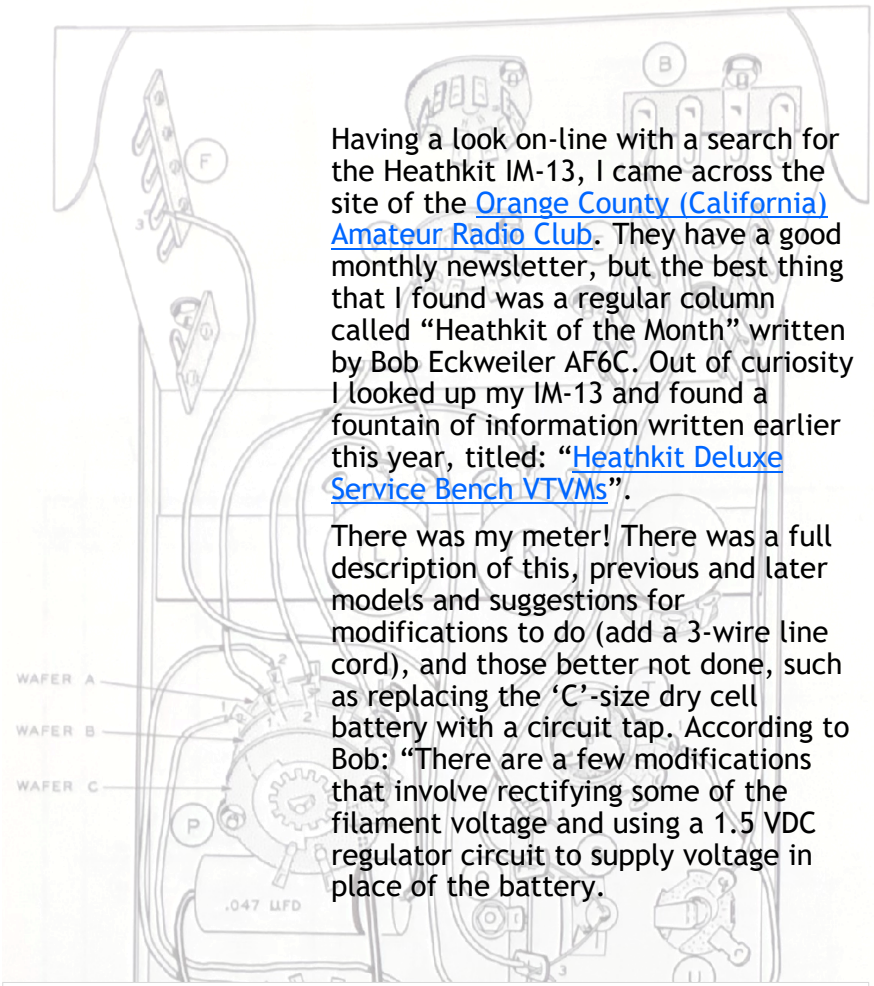
Resurrecting an old VTVM

I had some spare time, so I thought that I would have a long-postponed look at one of my earliest pieces of electronic gear. I'm talking about a vacuum tube voltmeter (VTVM) that I built as a high school electronics student back in 1968. Electronics was offered as an elective starting in grade nine and our school had a pretty well-equipped electronics lab for the day. I spent not only my classes there but often spent my lunch hour in that room. One day out teacher was very supportive and said that I should look at an electronics career. He suggested that I start gathering some test gear of my own and suggested a VTVM as a starting project as it would be relatively simple if built from a Heathkit, and that it would be relatively inexpensive. Furthermore, he said that if I completed the kit in class, he would give me extra credit and that I could use the school's tools and soldering iron. We had a Heathkit store on Kingsway in East Vancouver and, with about $40 in hand from my part-time jobs I took the bus and bought the kit. It went together well over the course of about a week, and I used it quite extensively for about the next seven or eight years, including through my stint at BC Institute of Technology (BCIT).

After a brief career in the electronics industry, a move to a totally different field of employment, and a marriage, my gear, which now included an oscilloscope, audio and RF signal generators, solid-state digital multimeter, signal tracer, capacitor tester, color bar generator, transistor tester and various small kits and probes, all from Heathkit, were stored away. Fast forward about two decades and I decided that I should resurrect some of my gear and build something. The industry had changed… vacuum tubes were pretty much gone and integrated circuits were now abundant and state of the art. Sadly, most of my Heathkit gear was no longer fast enough to be of use. I sold, gave away or junked all but a couple of pieces. One was my original IM-13 VTVM.

I'm not sure why I retained it at the time, and I still have it. Likely it wasn't because of its capabilities. Long ago digital multimeters (DMMs) far surpassed the VTVM's capabilities and specs, and I use my DMM at least weekly. So, it must be sentimentality that caused me to hang onto it for so long. It has been mounted above my test bench for about five years and in that time, I've used it perhaps half a dozen times. It still responds when I power it on although the resistance function stopped working. I suspected the internal battery, as I don't recall that I ever replaced it.

SERVICE BENCH VACUUM TUBE VOLTMETER
MODEL IM-13



Having a look on-line with a search for the Heathkit IM-13, I came across the site of the Orange County (California) Amateur Radio Club. They have a good monthly newsletter, but the best thing that I found was a regular column called "Heathkit of the Month" written by Bob Eckweiler AF6C. Out of curiosity I looked up my IM-13 and found a fountain of information written earlier this year, titled: "Heathkit Deluxe Service Bench VTVMs".

There was my meter! There was a full description of this, previous and later models and suggestions for modifications to do (add a 3-wire line cord), and those better not done, such as replacing the 'C'-size dry cell battery with a circuit tap. According to Bob: "There are a few modifications that involve rectifying some of the filament voltage and using a 1.5 VDC regulator circuit to supply voltage in place of the battery.

This idea is appealing, but the circuits, so far seem, to be lacking. They take their power from the filament winding of the transformer, and if the VTVM uses an incandescent pilot lamp the filament winding is al ready being taxed."

I learned a lot from that article and memories of my build resurfaced. Newly motivated, and having some time available I decided to open 'er up to have look. Yikes… the Ray-O-Vac dry cell battery was definitely a goner. Fortunately, the housing and wiring survived intact. I put in a new alkaline cell which has a slightly higher voltage than the original carbon-zinc batteries. Everything else looked good as well. No leaky capacitors, nothing looked or smelled burnt. I replaced the 2-wire line cord as suggested for one with a 3-wire safety ground. I also pulled out my original manual, carefully preserved over the intervening fifty years.

HOM rev. A *Heath of the Month #110 - Heathkit "Deluxe Service Bench" VTVMs*

Heathkit of the Month #110:
by Bob Eckweiler, AF6C

HEATHKIT®

ELECTRONIC TEST EQUIPMENT
Heathkit "Deluxe Service Bench" VTVMs.
(IM-10, IM-13, IM-28, IM-32 & IM-5228)

Introduction:
During its reign, Heathkit sold three series of vacuum-tube voltmeters (VTVMs); the familiar table-top series, an AC only audio series and a professional series. The V-1, the first of the table-top VTVMs, was the second-ever Heathkit produced. The table-top models were the topic of HotM #19[1]. featuring the V-7A. The AC VTVMs were covered in HotM #47[2] featuring the AV-3. The professional "Deluxe Service Bench" VTVMs will be covered in this article. **Table I** shows the model numbers of the three groups and the range of their production dates.

In 1961, along with a major styling change, the VTVM prefix changed from "V" to "IM" (presumably standing for: Instrument, Meter). Various meters, other than VTVMs, share the IM prefix.

Figure 1: Heathkit IM-10 "Deluxe Service Bench" VTVM. The first of the Service Bench VTVM series, vertically configured with the controls below the large 6" meter. Photo courtesy of Chuck Penson - WA7ZZE.

Above: Yikes! I couldn't recall if this was the original battery.

Left: A great Heathkit resource may be found at the Orange County (California) Amateur Radio Club site.

I carefully followed the page of alignment steps and surprisingly the meter responded as it should except for a slightly lower reading on the AC alignment. Checking the troubleshooting chart, I saw that the culprit could be the 6AL6 tube. Oh well… that tube has been in there for fifty-plus years, replacements are expensive, there's no alternative, and I don't usually measure AC anyways.

Cleaned, polished and newly (almost) aligned, it is now back above my bench. That it will see frequent service is doubtful as I have a very good DMM that is portable and within easy reach for most of my measurement tasks. Still, sometimes an analog meter with a big meter face and a pointer seems more appropriate and easier to use. Besides… I get a warm feeling when I use it. The IM-13 will probably stay there for now, for as long as I last or must move to smaller quarters.

Here is a link to the index of Heathkit of the Month (HotM) articles: http://www.w6ze.org/Heathkit/Heathkit_Index.html

~ *John VE7TI*

OBVIOUS THINGS SHOULD ALL BE CHECKED OUT

Page 12-News You Can't Lose

If its June… it must be Field Day!

2022 FIELD DAY

June 25-26

Field Day is ham radio's open house. Every June, more than 40,000 hams throughout North America set up temporary transmitting stations in public places to demonstrate ham radio's science, skill and service to our communities and our nation. It combines public service, emergency preparedness, community outreach, and technical skills all in a single event. Field Day has been an annual event since 1933, and remains the most popular event in ham radio.

The objective is to contact as many stations as possible on the 160, 80, 40, 20,15 and 10 Meter HF bands, as well as all bands 50 MHz and above, and to learn to operate in abnormal situations in less than optimal conditions.

Field Day is open to all amateurs in the areas covered by the ARRL/RAC Field Organizations and countries within IARU Region 2. DX stations residing in other regions may be contacted for credit, but are not eligible to submit entries.

Each claimed contact must include contemporaneous direct initiation by the operator on both sides of the contact. Initiation of a contact may be either locally or by remote.

Our SARC-SEPAR team has traditionally done well at Field Day. For many years we were in the top three for Canada and several years we were first in our category.

COVID significantly affected our ability to staff a competitive station so, for the past two years we have combined aggregate scores from our individual home and remote stations, as permitted in the amended Field Day rules.

This year the plan it to enter our station into the Class F (Emergency Operations Center) category from our Operations and Training Centre (OTC).

Jason VA7IJT has once again agreed to be our Field Day Coordinator. He will arrange to have an email sent out shortly to begin assembling this year's team.

~ John VE7TI

Page 13–News You Can Lose

The Lighter Side of Amateur Radio

Worldwide Controversy Over Radio Manufacturer's Plans to Have S-Meters go to S-10.

- Reporting from an undisclosed location in Shinagawa-ku, Tokyo, VE7NZ/JA1.

From recently leaked documents it appears that Amateur Radio equipment manufacturers are about to part with tradition and change S-meters to go to S-10 instead of S-9. This has caused a huge debate on social media. While some hams see the higher signal reports as a boost to otherwise poor conditions, many are outraged that only people with money for new radios get to hear these stronger signals.

Speaking on the condition of anonymity, Hitoshi Yakamoto from Yaesu said that they wanted to do something truly innovative for ham radio. After much discussion, the design team agreed an extra S-unit was perfect, although one of the new engineers said he couldn't recall studying S-units in school at all.

The debates are intense. Contesters are wondering if everyone is now "5-10" or just those with the new radios. Others feel it is just another example of the metric system taking over.

~ Adrian VE7NZ

Coax Stretcher

Did you cut your coax a few inches too short? No worries, use our new COAX STRETCHER to lengthen any coax to fit! Also performs the following vital functions:

- Changes RG-8 into RG-58.
- Perfect for building tuned stubs.
- Changes diameter of dielectric.
- Can be used to adjust velocity factor.

A reader asks: But does this tool not change the coax impedance?

Emergency Comms

Amateur Radio Making A Difference

5. Supporting Emergencies

Tom Cox VE6TOX

There is a "sweet spot" when it comes to emergency preparedness. Emergency response organizations, such as police, fire, and EMS, need to excel at emergencies; Incidents classified in the Incident Command System as Type 5 (small, routine Incidents done in a few hours or a day) or Type 4 (larger emergencies that are controlled in one day but may need further time for recovery and investigation). Emergency Management looks to the Type 2 (large multi-day or multi-week disasters requiring outside help) and Type 1 disasters (the big, bad community-changing disasters that last for weeks and take months or longer to recover from).

For amateur radio and other volunteer organizations, it is the Type 3 Incidents that we should be most prepared for; multi-day Incidents that are larger than routine emergencies but smaller and more often than once-a-decade or once-in-a-lifetime disasters. In the routine emergencies, volunteers are unnecessary and usually "in the way" of a routine and normal response. In disasters, volunteers are an absolute requirement, but are an unknown quantity for emergency management. It is in the Type 3 Incidents where we can do the most for ourselves and for those we serve.

It is Type 3 Incidents lasting a couple of days or more where we see all aspects of our emergency preparedness, plans, procedures and relationships come together and where we learn the essential skills for stepping up to the Type 2 and Type 1 disasters.

Let's look at everything that goes into getting really good at a Type 3 response.

Tom Cox (VE6TOX) is the Senior ICS Consultant with the Alberta Emergency Management Agency and a Master Instructor with ICS Canada.

He has taught over 400 ICS instructors in Canada, conducts professional development workshops across North America and has written extensively on ICS and ICS instruction.

He received his first ICS training as a volunteer with the City of Vancouver and the Vancouver Emergency Community Telecommunications Organization (VECTOR).

Convergent vs organized volunteers

The emergency services and emergency management don't know who random (convergent) volunteers are, what they can do, how they fit in, what their strengths and weaknesses are, their capability, nor their understanding of what an emergency scene is like. As a result, unknown volunteers are more trouble than they are worth. You would never use them unless you have no other possibilities or you are no longer in control – which makes it a disaster rather than an emergency.

Organized volunteers are the safer bet for emergency management. Like St. John Ambulance, Search and Rescue, and Team Rubicon, the organized volunteers have some level of organization, quality assurance, emergency knowledge, and capabilities that can be used. Things like security checks, volunteer standards, policies, specified training, and regular activities move organized volunteers into a more trusted, more capable, more self-managed group that can be used in emergencies.

One of the first questions should be "What level of group organization and policies would make your group a trusted and useful organization to emergency management?"

Often, we have two camps. Individuals who would like to organize and be of use may lack funding, leadership, and numbers. On the other side, there are the individuals who like to help, but won't get security checks, don't attend training, and don't like the politics of volunteer groups, and always say "If you need me, call".

Volunteer management is an article on its own!

Let's focus on what a group of volunteers can do if they are willing to organize to even a limited degree. The Incident Command System (ICS) has some advantages which may be useful to this group.

Photo Credit: ARES Edmonton – Evansburg Fire

Understanding what you are getting into

The emergency services are trained, equipped and designed to deal with emergencies. It is the Type 3 Incidents that they are less familiar with and begin to need assistance for other organizations. As well, these are the Incidents where the Incident Command System, and specifically Unified Command, starts to shine.

These Incidents are characterized by more injuries, fatalities, mutual aid, confusion, convergence, evacuations, and management requirements. Most importantly, these are rarely completed in one or two days. Dump, tire, and recycling plant fires, wildfires near towns, hazardous materials spills and train derailments, flooding, and missing children are examples.

It is the impacts on people and communities where the assistance is often required, not with dealing with the actual hazard. The impacts are more than 24 hours; people out of their homes need shelter, food, information, and supports. There are

Weather not only has an impact, it also changes as day turns to night, sun to rain, and/or winds change directions.

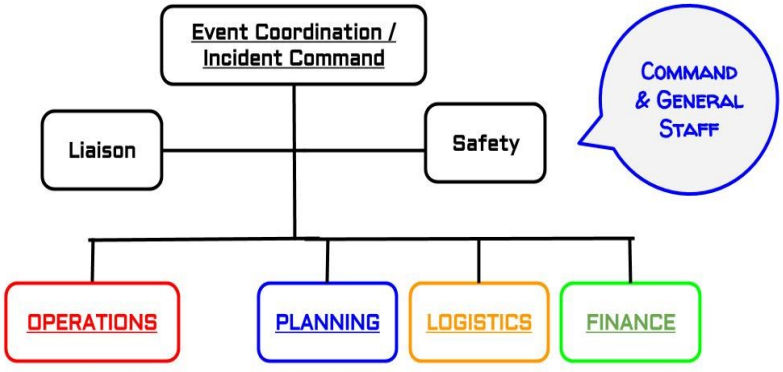
secondary impacts on communities with traffic and service disruptions, massive information needs, and a changing situation.

Weather not only has an impact, it also changes as day turns to night, sun to rain, and/or winds change directions.

These Incidents often don't have the whole scope known. They may be bigger than the eye can see, they may have cascading impacts on critical infrastructure or may still be spreading, or the exact threats to people, property and the environment cannot and are not fully known.

These are the Incidents we need to get good at as we can offer some assistance, not get in the way, and these will help provide us with the experience and examples to fine-tune everything required for large-scale emergencies and disasters. This is where relationships are solidified, trust is established, and credibility is recognized.

All the work has to be done before the start of the Incident.



ICS uses a standard system of naming sections and the positions within those sections.

Characteristics

Understanding the characteristics of Type 3 Incidents will better prepare you to assist. Type 3 Incidents have most of the characteristics of a large emergency or disaster without the scale. Communications will fail, the scope will not be known, emergency services are equally affected by road closures or weather, injuries and evacuations will be occurring, and the situation is constantly changing.

For communications failures, recognize that the phones and internet are likely working. But there are two areas where communications almost invariably fail. First, the Incident site activates an Emergency Coordination Centre ECC (sometimes still referred to as an Emergency Operations Centre EOC). Just because the site asked for the ECC doesn't mean they remember to provide them with regular updates. If the site hasn't needed an ECC for the last one thousand or more small Incidents, why do you think they will remember to update them this time? The site often doesn't remember that the ECC has been activated.

The other location is wherever the evacuees are. Evacuees have the greatest need for information. Most Public Information Officers are so busy trying to get on TV that they forget the reception centre doesn't have TVs. Report after report after report states "The evacuees received little or no information" or couldn't get questions answered, but the Public Information Office is proud of how many news conferences they gave.

Virtually every disaster characteristic begins to show in Type 3 Incidents and virtually every one would benefit from an amateur radio understanding and solution. However, if you don't know the characteristics, you will be duplicating communications rather than covering blind spots, will not be adding to situational awareness, and may be blind-sided by locations requiring communications that always have communications failures.

It's time to think: Do we know where the communications failures will occur or are we going to the locations where someone was able to call us, we are comfortable, or where we guess communications might be needed?

On Type 3 Incidents, it is often the ECC that needs communications, the reception centre (evacuees) and the nearest hospital to the incident (mass casualty). Then you need spares for the surprises.

Policies, plans and procedures

In the ICS I-200 course, there is a module on leadership, authority, and policies. This is taught as if policies, plans and procedures have nothing to do with the Incident Command System or are only created to tie the hands of someone dealing with an emergency. Policies, plans, and procedures are "ICS done in advance." Rather than being designed to impede a response, they attempt to encode the best ICS practices.

I ask ICS classes "How long do you think we have been putting white stuff on the red stuff (water on fire to put a fire out)?" The best reply I have ever heard was "Since about five minutes after we 'invented' fire…". Putting water on fire meets all the considerations of the best general strategy for putting out a fire; it is fast, efficient, cheap, generally available, and safest for responders. Fire departments around the world use water to extinguish fires. Unless there is no water, the fire reacts to water (such as magnesium fires), the fire is too big, or it will drown the responders, we put white stuff on the red stuff.

All policies, plans, procedures in emergency management are "ICS done in advance." This gives you the best Incident Command outcomes (remove threats to the three ICS Priorities) without having to think. No Incident Commander arrives at a house fire and starts with "Build a steel containment dome to lower over the fire to remove the oxygen" or "Get a bulldozer and cover the house with dirt to prevent combustion".

But ICS in advance has one major limitation. If the advantage of the policies, plans, and procedures is "You don't have to think", then the limitation is you don't know how to think when the policies, plans and procedures don't work. When a wildfire comes into a city, bulldozing rows of houses or buildings to create a fire break when there is not enough water (as was done during the Fort McMurray wildfire or the Slave Lake wildfire) takes thinking. It also worked.

For your amateur radio group, you need to "ICS it" by putting together a series of policies, then plans, and use the established ICS planning process to support emergencies and disasters.

What is your policy on training? What is your policy on security checks? What is your policy on participating in activities such as weekly nets, training, and events?

Written policies, accurate training and participation records, and established plans provide a level of confidence and understanding that emergency managers require to be able to use you more often and more comfortably. Be transparent – if your group doesn't have security checks, say so. You may find assistance in getting them, you may be able to track members that have

them with other activities and groups they belong to, and being open and honest will build trust in your organization and leadership.

Checklists

First, make a cup of coffee.

The airline industry has used checklists for decades and aircraft accidents and fatalities have gone done virtually every year since. When I was with St. John Ambulance, our checklist was based on "An injury or medical emergency can occur anytime." We had a jump kit, oxygen, and cot with spine board ready immediately on arrival. Then we methodically set up the medical area, checked our radios and equipment and every detail on the checklist so we knew we were organized, ready, and had everything needed. Even knowing an item is missing is better during the checks than finding out on a call.

The single best piece of advice I was given in emergency management was the very first item on my checklist: "Make a cup of coffee".

By the time the water boils, you will have had time to check the weather for the next 24 hours, replace all electronics with fresh batteries, considered what you will need to do the job, cleared your family / work / pet commitment. Most importantly, the time for the water to boil slows you down and makes you think. The checklist makes sure that you have everything you need, less things to worry about, and have a better frame of mind for what may be a long day. Make a cup of coffee should be the first thing on everyone's list; Helene (who was adamant about putting it on the checklist) didn't even drink coffee!

ICS Training

As an ICS Instructor Trainer with 25 years experience, I can tell you two things about ICS application in general; first, do it by the book. Second, most organizations don't do it by the book. The best organizations at ICS are those who do not make any changes to ICS doctrine, structure, or application. The U.S. Coast Guard stands out as a gold standard. Even the wildfire organizations take shortcuts, make changes for convenience, and don't understand its nature. ICS was never a wildfire system. It was specifically, deliberately and intentionally designed to be an all-hazards management system. It was designed as a system, not as a menu to pick and choose from. And nobody has come up with a better system in half a century of use. Those who modify ICS deride the "purists" but then are the ones making the mistakes, having inefficient and/or ineffective responses, and are unable to operate with others because any modification to ICS destroys its most important attribute; interoperability.

Being called a "purist" is the highest complement anyone can give you when it comes to ICS. It means you are less likely to make mistakes and will have better responses.

Most organizations do ICS training closed off from other groups. Any visitors are unwelcome, might see their weaknesses in ICS application, and might see that the members don't understand as much as they think they do. The reverse is actually true. By inviting outside organizations to your training, you see where everyone struggles to understand the concepts, you gain a greater

understanding of the all-hazards and interoperability strengths of ICS and you reinforce the bonds and relationships that ICS instantly creates when everyone has the same purpose, language, process, and understanding.

Don't just invite other volunteer groups. Invite the emergency responders, the emergency management and the utilities to your training. Any mixed class given by a recognized instructor will be better than a class with a single organization. For those attending, an ICS Canada or FEMA certificate is equally valid as any certificate and the outcome of the course will be actually better than a single fire department or police class course.

Situation reports

Situation reports are an art form. The format can be determined before any Incident occurs, the policies can ensure that they are serving their purpose(s) and they can be practiced on a weekly net or any event.

I have a format that I use for any situation update; all I need is a white board or piece of paper and I can make it work anywhere and any time. I will write an article on Situation Reports in an upcoming issue, but there are a couple of key things about situation reports that can be summarized here.

You need to know what content is required; giving situation reports on anything that doesn't directly support the response efforts is wasting time and concentration. The reports must be regular and brief. Once you start, you cannot stop for the duration of the Incident. Most importantly, information must be shared, not just captured. If you do not make the information readily available, then nobody can use it. If you are supporting non-amateurs, you cannot expect them to get the information over an amateur radio frequency. Information must be displayed. Information must be updated. Information must be relevant. Information must be time-stamped.

While communications may be one-way, such as emergency warnings, most information benefits from two-way communications for clarification, verification, and shared understanding.

Formal messaging

I was dragged kicking and screaming into formal messaging; it's a lot of work, seems unnecessarily complicated, and takes a lot of time. I fully understand why and how formal messaging works, from the phonetics, the conventions, and the forms.

Formal messaging, like any skill, takes practice. Field Day is a great place to practice your formal messaging, along with Incident Command for planning and setup. The whole idea of Field Day is to improve and demonstrate your skills and capabilities as well as learning new skills and modes of communications.

Whether you are helping a team compete, participating as an individual, or simply helping others get points, put aside Field Day

Photo Credit: Curtis Compton / AP

as one of the key practice days to keep sharp for when an emergency calls.

An exercise

I have an exercise called "Exercise Swimming Pool" that I have often used with amateur radio to develop and understanding of emergency communications for one hazard, but of increasing size and complexity. Based on a building fire where chlorine is stored, the scenario starts with a Type 5 Incident (one small building) and then moves into a much larger warehouse scenario (Type 3 multi-day response) and finally into a large-scale operation involving the evacuation of tens of thousands of people (Type 2). The latter two are based on actual Incidents, where news coverage and after-action reviews can provide more specifics, nuance, and additional challenges.

Almost invariably, when presented with the Type 5/single small building scenario, the amateur radio operators will deploy here and there and everywhere. This is exactly why amateur radio gets a "bad name" with emergency services; they have not been requested, they are not needed, and they are not known.

But the response everyone suggests for the small Type 5 Incident is very likely a very appropriate response at the next higher level. It is possibly the Type 4 (full day) and often Type 3 (multi-day) responses, where ad-hoc locations are arising and specific types of communications failures are beginning to appear. The type of thinking that would be an unnecessary and unwelcome amateur radio response in the first part of the exercise (Type 5 routine emergency) is exactly what is needed to suit the Type 3 Incident and can scale up for a Type 2 or Type 1 Incident.

Conyers, Georgia chlorine warehouse evacuation 2004. Evacuations create tremendous information needs and amateur radio can assist. This Incident was the basis for the Type 3 portion of "Exercise Swimming Pool".

Discussing why a Type 5 and Type 4 Incident won't need support (unless asked for) helps prevent unwanted and unappreciated deployments and the impression of an unprofessional organization. Understanding the needs of a Type 3 Incident will help fine tune policies, plans, and procedures. The Type 3 will also allow you to see how checklist, situation reports, forms, and organization reduce the confusion and increase the effectiveness of amateur radio communications. Discussing the characteristics of Type 2 and Type 1 Incidents will show how any organization for Type 3 Incidents will support expansion into Type 2 and Type 1 disasters.

This is why Type 3 Incidents are the ones you should get good at. They happen more often than disasters and put all the components in place for larger responses.

An actual incident

In May 2005, a fire at a recycling plant containing a "witches' brew" of hazardous materials erupted. Amateur radio set up net control at the municipal EOC that had been activated to support the site. Throughout the duration of the incident, amateur radio demonstrated how their plans, policies and procedures could support the city.

First, situation reports were regularly broadcast and posted on a white board behind the next control. Amateurs were using ICS to organize and the policy of "Do not check-in on the frequency unless you are ready to deploy within three minutes" meant the frequency was acting as a virtual staging area. At intervals, the Planning Section Chief would come into the amateur radio room and take notes. When asked what he was doing, he stated "We haven't had any reports from the

site since it started. I don't even know which way the smoke is blowing." Net requested a smoke report and the Planning Section Chief noted he was getting more information from the hams than from the IC.

Because ARES does severe weather spotting, we have a relationship with Environment Canada and phoned the "back door" phone line to get spot weather forecast. The forecast was a 180-degree wind change in a couple of hours that would blow the smoke from going over an empty field around to go through a residential neighborhood. When advised, the Planning Section Chief said "Don't even joke about that!" He was provided the Environment Canada phone number and he came back after verifying the information saying "We would have been completely blind-sided if you hadn't told us that."

When asked if we could staff a communications desk at a reception centre, we replied "We are already there." "How can you be?" we were asked "We haven't even decided which reception centre to open, yet." We can stage anywhere and we staged to amateurs at the nearest reception centre location that would not be impacted by smoke. That was the one they were contemplating opening.

Later, we were asked if we could have handled another location and we said "Yes!". As members were deployed, more amateurs were requested and phone fan-out used to get more spares for organizational capacity. It turned out that the Incident Commander's radios were dead from continued use and he didn't even know it. Communications had failed from the site to the ECC.

Long story short: Amateur radio had demonstrated how policies, procedures, ICS, events, formal messaging and relationships all come together on a Type 3 Incident to support emergency management efforts.

The situation board in the amateur radio room at the City of Edmonton

Up next issue: 6. Supporting Disasters

You have your ICS training, have practices formal messaging, supported community events and understand how and why communications fails. Your policies, plans, procedures and checklists have been tested and tried through multiple events and the occasional Type 3 Incident. Now it is time to look at Type 1, "The Big Ones".

~ Tom Cox VE6TOX

Watch Tom's Seattle Emergency Communications Academy presentations at:
https://youtu.be/yGe_mRjsC_M?t=27039

Photo Credit: ARES Edmonton

Radio Ramblings

Kevin McQuiggin VE7ZD/KN7Q

Antenna Upgrade

As you are likely aware, I have been active on 1296 MHz (23 cm) EME for almost a year [1]. Starting in 2020 I planned a small station that I hoped would enable me to make reliable moonbounce contacts. Station design and collection of the required components took several months, and it all came together in August 2021 when I deployed first a receive-only EME setup, and then added transmit capability to my station towards the end of the summer.

I had success with my small station, which utilized two 45-element loop Yagis, 350 watts power and the technological benefits of digital signal processing as described in [1]. I completed 101 QSOs with 44 stations in 16 countries over 9 months of EME operations. I am very happy with the results!

Figure 1 – Loop Yagis in January

However, while I could hear many stations and work most of them, I found that my antenna gain was just too low to work mid-size and smaller stations on EME with regularity. Other ops had to dig hard to decode my signals, and there were many smaller EME stations that I could hear but not work.

If I wanted to improve my station's performance, it was clearly time for an antenna upgrade.

Path Loss

EME is unforgiving due to the huge degradation of signals over the immense earth to moon (and back) distance that signals must travel to complete a QSO. The moon only reflects about 6 percent of any signal that encounters the lunar surface – the rest of the signal is absorbed [2]. Receiver efficiency is critical, as is maximizing your transmitted signal. Losses in the TX path, or even more critically, the RX path can mean the difference between success and failure.

The radio signal path loss over an average lunar distance of 384,400 kilometers, or 1.28 light-seconds [3] is about 271 decibels [4]. This means that transmitted signals are $10^{27.1}$ times weaker at your receiver than they were when they left earth.

With a poor receiving setup (high noise figure) or feedline that is low quality or too long, you will hear nothing. The signal will be lost in the feedline or in the receiver itself and there will be nothing left to demodulate.

Antennas Have Gain

As I am discussing an antenna upgrade for the next version of my EME station, some discussion of antenna gain is in order.

Antenna gain affects both transmitted and received signals. My 350-watt signal through the two loop Yagis with 22 dB of gain will have the effect of amplifying the signal's power to 55,475 watts. 22 dB is another way of saying 10 to the power of (22/10) or $10^{2.2}$.

$10^{2.2}$ is 158.5. Multiply 350 watts by 158.5 and you get 55,475 watts. This is the "effective radiated power" or "ERP" of my antenna. It sounds very impressive.

However, despite the apparently huge ERP of my station's signal, only 4.41×10^{-23} watts, or 0.00000000000000000000000441 watts of that signal will return to earth, due to the average EME path loss of 271 dB as described above. That's a very weak signal! Despite this, EME communication is possible. My small station produced marginal performance and QSOs were only possible with bigger stations.

Antenna gain applies to received signals too. 22 dB of antenna gain will have the effect of "amplifying" every received signal by $10^{2.2}$, or 158 times. As decibels are logarithmic, a small increase in an antenna's dB gain figure can have impressive results, as we shall see in the next section.

Decibel changes (both positive and negative) can be deceptive because we humans are used to thinking in linear, rather than logarithmic, terms. If I could increase my receive antenna gain from 22 to 28 dB, it doesn't sound like much of a change, but a 6 dB increase in gain actually increases an antenna's apparent "amplification" by 4 times [5]. A 9 or 10 dB increase such as I may be able to achieve in my station's upgrade will make all received signals 8 to 10 times "louder" at the receiver [6].

Parabolic Antennas

Parabolic (dish) antennas exhibit very high gain figures in comparison to their overall size and mechanical/electrical complexity compared to other antennas or antenna arrays at VHF and above [7]. At 1296 MHz, the electrical and mechanical advantages of a dish compared to an array of Yagis cannot be beaten! Dishes are easier to mount, to feed, and to point than Yagi arrays, as I discussed in [7]. A parabolic antenna was the obvious choice for the next iteration of my station.

Figure 2 shows how the gain of a parabolic dish antenna increases with diameter at 23cm. With reduction of feedline losses at my station I am hoping to achieve 9 or 10 dB of gain compared to my old loop Yagis.

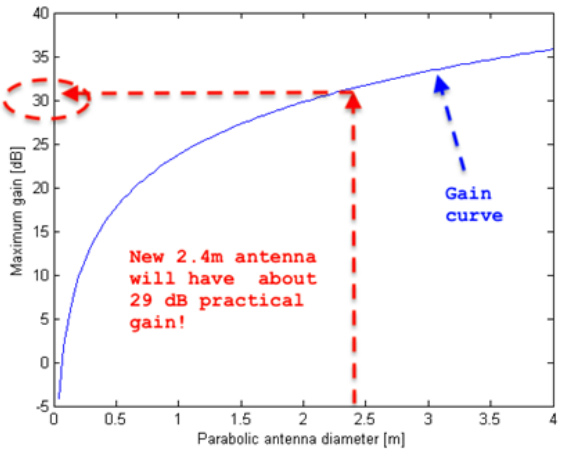


Figure 2 – Parabolic Antenna Gain vs Diameter [8]

A Foldable Antenna

My new antenna is shown in our backyard in Figure 3. It is a 2.4-metre diameter folding parabolic dish that was designed by Paul Andrews, W2HRO [9]. The surface of the dish is made of a radio-reflective fabric that is stretched to a parabolic shape by the clever design of the ribs which support the antenna. The dish collapses like a patio umbrella *(see Figure 5)* for easy storage and transport. It weighs less than 10 kg.

This collapsible aspect had great appeal to me, as I will be able to operate EME (and other microwave work) using a "portable" setup as well as from the backyard at home. The antenna will also work on higher frequencies, so I will be able to try some homebrew radio astronomy with it as well.

Pandemic Delay

Figure 3 – First Deployment

With the assistance of my friend Dennis AC7FT (VE7BPE), who offered to take delivery of the antenna and store it until the border between Canada and the USA reopened, I asked Paul to ship the antenna to Dennis' home in Portland, OR.

There it languished for several months until COVID border restrictions eased and it became convenient for me to make the 5.5-hour drive south to retrieve it.

I suppose that I could have had the antenna delivered to my home in Burnaby, but that would have been much more expensive and involved Canada Customs, brokers, and much more paperwork on W2HRO's part. As Dennis had decided to buy the same antenna anyway, it was the "net best" solution to ship both antennas (and two heavy duty dual-axis rotator units – but more on that later) to a single location. Dennis was happy to store my antenna and rotators until I picked them up in early April 2022.

Canada Customs

My XYL Laura (VE7LPM) and I drove to Portland, visited our friends, and picked up the antenna and rotators on the first weekend in April.

It is always easier to self-import technical equipment into Canada than trusting it to brokers and customs officers do not see such equipment often and who probably have little understanding of the devices and what they are used for. I find that if I accompany the equipment and handle the importation myself that I can explain its function and use to the customs officer and answer any questions that he or she may have.

In particular, amateur radio equipment may be imported duty-free, and unless customs understands that this is ham radio gear, they may erroneously charge duty on it. If I am with the equipment as it enters Canada, then I can ensure that the customs officer codes it in the appropriate category.

Canada Customs was helpful and friendly. The import went smoothly, I paid the required taxes, and we were soon home after a busy weekend in Portland. The antenna went to the basement to await unwrapping!

First Deployment

See Figure 4 for a photo of how the antenna looked in its storage/transport bag once I got it out of its protective bubble wrap. W2HRO had not spared any polymers and the antenna was wrapped (and wrapped, and wrapped!) very securely to ensure its integrity in transit. No damage!

I removed the antenna from its carrying bag *(see Figure 5)* and noted the silvery appearance of the material which, when stretched, will form the surface of the dish. The feed (that part of the antenna which radiates the actual radio signal, *see Figure 7*) was inside the folded dish and will be exposed as the ribs of the dish stretch the fabric taught. You can see the antenna's first deployment in Figure 3 above.

The centre of the antenna contains two clamps which fasten the antenna's central axis to a crossboom. *(See Figure 6)* to see how this worked with my own elevation rotator.

Figure 4 – Dish Antenna in Storage Bag

Feeding the Antenna

Now that the antenna was deployed, I was able to test its rotation in both azimuth and elevation. I will be using an interim rotator (a Yaesu G-5500 dual-axis rotator) for the initial period of the new antenna's operation. The G-5500 will work, but it has very rough pointing accuracy for EME [10] so Dennis AC7FT and I are developing a new dual-axis rotator controller which will be able to point and move the dish with about 100 times the accuracy of the G-5500. That will be the subject of a future column!

Figure 5 – Antenna Unwrapped

The next step was to design the feed system for the dish. The feed at the focal point of the dish has two ports, one for RX and one for TX *(See Figure 7)*.

The RX port needs to have a low noise amplifier (LNA – like a preamp) attached to it to amplify received signals as close as possible to the antenna. The TX port will deliver RF power to the antenna on the transmit path. In my case, this will be 350 watts (minus feedline losses).

It is critical that the receive LNA be protected from damage by the transmitter power! Even a watt (or less) into the LNA during transmit will "blow" the LNA, rendering the RX portion of the setup useless.

The solution to this is to use a "sequencer" and a series of high isolation RF relays to remove the LNA completely from the transmit signal path before transmit power heads down the coax. The sequencer ensures that the relays are in the proper positions for both TX and RX. The sequencer also powers down

Figure 6 – Antenna Clamps on Elevation Crossboom

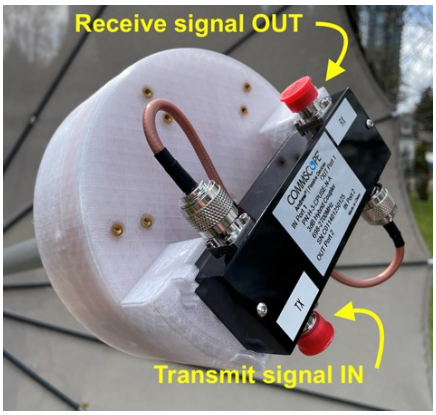


Figure 7 – RX and TX Ports at Feed

the LNA completely before the transmit RF is sent down the feedline.

This approach works. My power amplifier has a built-in sequencer so all I had to do was reconfigure my relays for use with the new parabolic antenna. It sounds easy, but you have to put some deep thought into the TX/RX switching process to make sure that it is right. My final relay setup, including the LNA, is shown in Figure 8.

Testing is critical as mistakes cost time and money. That said, just about every EME operator has "blown up" his LNA at one time or another through error or misadventure.

Performance

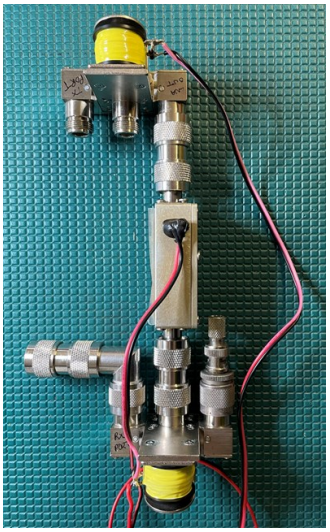


Figure 8 – Relays and LNA for New Antenna

About a week ago, I was all set for the first test of my new antenna. I left the TX port on the feed disconnected and disabled transmit on my radio (Icom IC-9700) as I did not, in the first tests, want to risk an error that would damage the LNA or my power amplifier. This would be a "receive only" test so that I could compare the antenna's performance to that of the old loop Yagis.

My initial test involved pointing the new antenna at the sun and noting the amount of increase in noise I could hear in the receiver's speaker. The sun is an excellent noise source as it radiates radio signals at all frequencies.

When I pointed the new dish at the sun, I noted two things:

1. That the level of noise increased significantly when the antenna was pointed at the sun – I heard much more noise than I had ever heard with the two loop Yagis; and
2. That the noise increased and decreased very rapidly when I moved the antenna on to, and then off of, the sun. This indicated that the beamwidth of the new antenna was very narrow. I had also not seen this behaviour when I was using the old Yagis.

This "sun noise" testing being complete [12], I decided to wait for moonrise and conduct the very first receiving test on the new antenna.

The moon's declination cycles throughout its 28-day orbit of the earth from northerly to southernly and back again. A northernly declination places the moon well above locations in the northern hemisphere, up to about 25 degrees. Southerly declinations do the same for the southern hemisphere, down to about -25 degrees relative to the earth's equator.

Unfortunately, I was ready to test when the moon was just about at its most southernly declination. This is not ideal for operators in the northern latitudes like me, at approximately 49 degrees N. For operators in the northern hemisphere, during this period of about two weeks the moon rises for a shorter period of time, and does not rise very far into the southern sky. Trees, building, and "ground noise" are much greater than when the moon is at a northernly declination and (say) 60 degrees up in the sky and well clear of all obstructions.

The maximum elevation for the moon when I conducted these initial tests was only about 15 degrees. Not many EME ops were active due to the poorer conditions than normal. I decided to conduct my testing nonetheless.
I would use WSJT-X in its Q65-60C mode, the current standard for EME operation on the 23cm band.

The first thing I noted is that the signals I heard were much louder (brighter on the waterfall) than I had ever seen before. This was encouraging! Decodes arrived quickly, and I noted that I was decoding one fellow (Bill, KB2SA) who I had never been able to see before on Q65-60C. See Figure 9 for the first two decodes I saw on the new antenna.

Single-Period Decodes

UTC	dB	DT	Freq	Message
				---------- 23cm
0556	-26	2.6	1497	: CQ KB2SA DM13 q3 U.S.A.
				---------- 23cm
0557	-24	2.5	1492	: KB2SA KA1GT FN54 q0

Figure 9 – First Decodes on New Antenna

I was not yet set up for transmitting so there was no chance of a QSO, so I shut down the station for the day and was happy that the new antenna was performing so well.

Figure 10 – Relays/LNA All Set

Moving to TX: Murphy Interferes!

It was time to work on the TX side of the station. I checked the operation of my TX/RX relays to ensure that they were properly switching the transmit and receive paths to the dish's feed point. I mounted the relays in a waterproof box right behind the antenna *(see Figure 10)*, cabled up the TX and RX ports, and decided that I was all set.

I fired up the rig, the power amplifier, and lastly the LNA. I heard the usual noise increase in the rig's speaker as the LNA powered up, but then things went strangely silent. Then the sequencer inside my power amplifier went offline. The power to the sequencer and amplifier control circuitry inexplicably failed. Fortunately, the power amplifier proper had not been affected.

I was perturbed – everything had just checked out normally. Murphy had struck.

My first thought was that I had somehow made a wiring error and that the LNA had failed. However, I recalled that the testing just conducted had gone normally. This couldn't be the case. And I couldn't imagine why an LNA failure would take out the sequencer too. My mind jumped to the possibility of a short circuit.

I power cycled the amplifier/sequencer, but there was no change. I disconnected the relays from the sequencer and attached a handy battery and voltage/current meter *(see Figure 11)* to the cable going from the shack to the relay box.

The ammeter in the device showed that the relays/LNA were drawing 9 amps. Yikes – they should have only been drawing about 0.7 amps from my testing. There was definitely something wrong in the waterproof box.

Figure 11 – Handy 12V Battery and Voltage/Current Meter

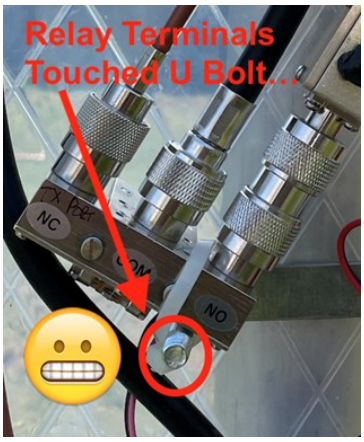


Figure 12
– Point of Short Circuit

I went outside and inspected the relays. I discovered that the relay assembly, which I had fastened to the box, had rotated slightly counterclockwise inside the box. This had caused the two terminals of the lower relay to come into contact with one leg of a large U bolt which was holding the box to the antenna mast. See Figure 12 for where the point of contact was. The contact had caused a short circuit. I repositioned the relay assembly and tested the current draw again. It was back down to a normal 0.7 amps.

This led me to investigate the LNA/ relay output of my power amplifier. It turns out that the short circuit had blown a small 12-volt power supply inside the sequencer portion of the amplifier. This supply powers a microprocessor and some sampling circuitry as well as the sequencer itself.

Fortunately, I had the schematic of the amplifier available and was able, after some debugging, to isolate the problem to this power converter circuit, and the failure of a single power converter IC. Nothing else appears to have been affected. I have a new IC on order from Digikey and have ordered some other components as well in case other parts were also damaged by the excessive current.

Figure 13 – It's Alive Again!

With any luck my sequencer/controller/ amplifier will be back in service and ready for TX testing in a couple of days. The positive side is that the power amplifier proper has not been damaged, and that I am still able to receive well on the new antenna.

Status Update; Mitigation

The parts arrived from Digikey shortly after this article was originally written. I installed the new voltage converter IC. The sequencer, LCD display and CPU sprang back to life, and the amplifier seems to be functioning normally.

The new IC is from a different manufacturer, so I had to readjust a trimmer potentiometer slightly to reset the voltage output to 12V, but this is not unusual as there is always some variability in IC performance. Now to get on the air with the new antenna!

I feel fortunate that nothing else in the amplifier was damaged by the short circuit. To mitigate risk, I am going to install a fuse in the external 12 VDC line which controls the LNA and TX/RX relays to prevent this failure from happening again. I will also insulate both legs of the U bolts in the waterproof box.

The station is now operational. In fact, I made my first four QSOs on the dish on the morning of April 27th. My first contact was Skip, N0CTR in Minnesota, see Figure 14. I will have to spend some time over the next few weeks optimizing the dish's pointing: because of its narrow beamwidth, azimuth and elevation factors while tracking must closely follow the moon. This was less of a problem with the broader-beamwidth loop Yagis. I will also work towards maximizing sun noise, i.e., getting the dish to perform to the maximum of its capabilities.

Conclusion

I am looking forward to enhanced EME operating capability, and this upgrade project has been interesting and fun. I have learned about new aspects of antennas and antenna feeds, and (unfortunately) also had the opportunity to improve my electronic debugging skills and learn something new about power converter circuits.

Also important is that in "rolling with the punches" of a Murphy's Law event, I have gained confidence in my hobbyist-level electronic knowledge.

I am not an electronics professional, nor do I have any formal training in this field, but having to apply the electronic theory which we all learn as part of our training in amateur radio [14] really does challenge us and make us better hobbyists. Never think that you can't learn new things or solve a technical problem. As I have written before, the development of technical skills is one of the cornerstones of our hobby. That is one of the reasons why governments around the world support amateur radio in the first place.

We should all have confidence in our ability to read, learn, and to apply what we learn, in order to solve these technical problems whenever they arise in our own amateur radio activity. Be confident that you can learn the stuff that you need to know to solve these problems: every journey begins with a single step [15].

That's it for this issue! Feedback on this article can be directed to the Editor, or directly to me at mcquiggi@sfu.ca. Thanks for reading!

73,

~ Kevin VE7ZD / KN7Q

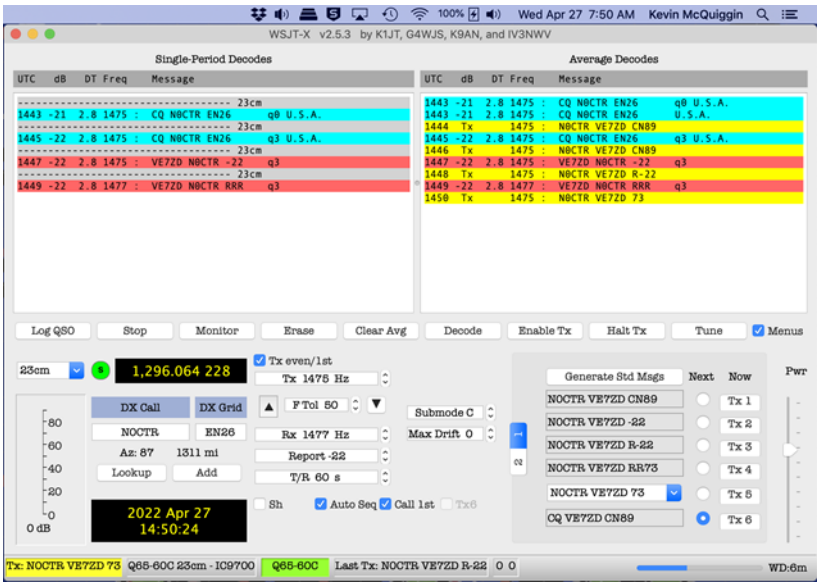


Figure 14 – First QSO on the new Antenna

References:

[1] *The Communicator, September/October 2021, page 15. See https://bit.ly/SARC21SepOct*

[2] *See https://en.wikipedia.org/wiki/Earth%E2%80%93Moon%E2%80%93Earth_communication*

[3] *See https://en.wikipedia.org/wiki/Moon#Orbit*

[4] *EME basics: "How to Use Amateur Radio Moonbounce, EME Propagation" at https://www.electronics-notes.com/articles/ham_radio/amateur-propagation/moonbounce-propagation-eme.php*

[5] *A 3 dB change in a signal's strength makes the signal sounds twice as "loud". Why is this? Take the dB change, divide it by 10 to get 0.3, and then use your calculator to compute 10 to the power of 0.3. $10^{0.3}$ is 1.995 which everyone in the field rounds to 2. A 3 dB change makes a signal appear two times stronger. A 6 dB change will double that again, making the signal appear to be 4 times stronger*

[6] *See [5]. 9 dB means a factor of 10 to the power 0.9. $10^{0.9}$ is 7.94, or close to 8.*

[7] *The Communicator, November/December 2021, page 14. See https://bit.ly/SARC21NovDec*

[8] *Base graphic from https://www.researchgate.net/figure/a-The-offset-parabolic-antenna-b-theoretical-gain-vs-diameter-of-a-parabolic_fig3_335730140.*

[9] *W2HRO describes his folding dish antennas at https://sub-lunar.com/. Video demonstration at https://www.youtube.com/watch?v=p66s1jF7760.*

[10] The moon subtends and angle of about 0.5 degrees in the sky. The beamwidth of all but the very largest parabolic antennas is much great than 0.5 degree, but to maximize signal on to (and off of) the moon at this great distance (remember, there is 271 dB of path loss), it is important to be able to point your antenna as accurately as possible. Rotators like the G-5500 have only about +/- 4 percent accuracy [11]: this translates to plus or minus 14 degrees accuracy in azimuth and plus or minus 3.6 degrees in elevation! Given the manufacturer's specifications, a parabolic dish's signal with a 3-degree beamwidth could easily "miss" the moon! Accuracy in pointing is very important.

[11] Manufacturer's rotator specifications, see G-5500 manual at https://www.yaesu.com.

[12] I will soon properly quantify the sun noise figure and beamwidth of my antenna, but this has not been done in time for this article. Sun noise is usually expressed in decibels (dB). One measures the noise level in dB when the antenna is pointed at the sun using either software such as WSJT [13] or even the receiver's S meter, and then subtracts the noise level when the antenna is pointed well away from the sun at another "cold" spot in the sky (i.e., a spot where there are no known strong radio sources). The difference in dB defines the antenna's "sun noise" figure. This number is used by amateurs (and even professionals) to compare the relative performance of their antenna systems. Many EME operators work hard to improve their sun noise measurement!

[13] See https://physics.princeton.edu/pulsar/k1jt/wsjt.html for a version of WSJT that includes "measurement mode" for calculating sun noise.

[14] And through our practical experience!

[15] Lao Tzu, Chinese philosopher, 6th century BCE.

~

ARDF

John Leonardelli VE3IPS

Radio Direction Finding Handbook vn3 by VE3RDD

Al Duncan VE3RRD

*May is Foxhunt month at SARC. With that in mind, here is a free book that may help get **you** started.*

Radio direction finding or RDF has been around since before World War One. From the time of the invention of radio, there has been a desire to know from what direction a radio signal was arriving at the listener's radio receiving antenna.

Amateur Radio has found several uses for RDF:

- Hunting down interfering radio signals, both accidental and malicious interference to repeaters (affecting both ham and commercial communications, including emergency services.
- Helping to locate downed aircraft by DFing their emergency locator beacons (ELT).

The entertaining sport of "fox", "bunny" or T-hunting.

It is "fox hunting" that has spread through many ham radio clubs around the world as a very exciting and fun aspect of the hobby. Fox hunting can take many forms of transmitter hunting, from a person hiding within a few blocks of the starting point with his handheld and periodically making a transmission while others try to find him on foot using

directional antennas; to a competition with multiple unmanned automatic transmitters scattered over a course that can be several hundred kilometers long – the entrants being required to find each transmitter in proper order with a minimum number of kilometers driven. Another variation called ARDF or radio orienteering is popular in Europe (just gaining popularity in North America) and includes jogging or running from one low power hidden transmitter to another while carrying RDF equipment in a timed race.

What makes fox hunting so popular?

- The social aspect of getting together with others with similar interests.
- Anyone can take part – you don't need a ham license since only a receiver is required.
- The satisfaction of building your own equipment such as an antenna or attenuator for use in RDFing.
- The fun and competitiveness of the hunt, which also can involve both physical and mental exercise (walking while searching, and the calculations and map plotting required to determine where the fox may be located).
- The outdoor aspect of the sport (sunshine and fresh air).
- After the fun of the hunt, there is always coffee and conversation at Tim Hortons to look forward to.

The "fox" has several basic requirements:

- Be able to move to a location unobserved by those who plan on taking part in the hunt.
- Be able to hide well enough at the location he has chosen so he will not be accidentally spotted. The hunters should have to almost stumble over him in order to find him.
- Be equipped with enough handheld battery capacity, water, lunch etc. for the expected duration of the hunt – it could be one or two hours or more in length, depending on the distance the fox is from the starting point and how well he is able to confuse the hunters as to his probable location.

~ John Leonardelli VE3IPS

https://ve3ips.wordpress.com/

Please download the complete book

RDFing v3~ *Al VE3RRD*

~

Antenna Adventures

Sander van der Haar PD9HIX

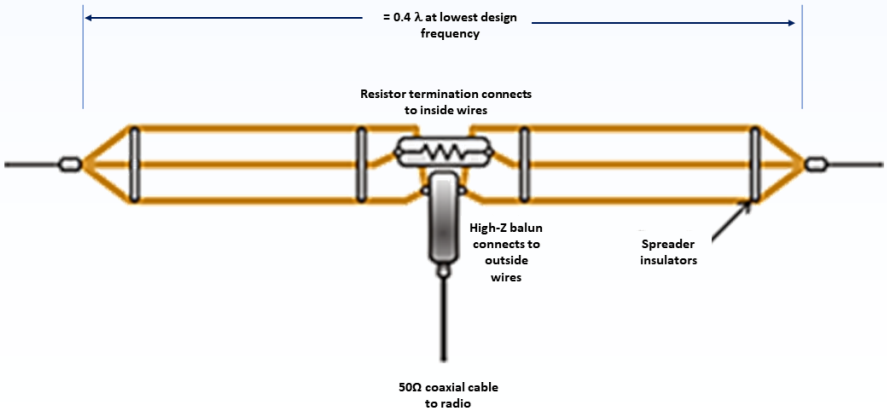
The T3FD antenna

Sander has, in recent months, "done some tinkering at home and does not want to deprive the amateur world of what has become a great success!" Well, then of course you made us very curious...

Always busy with antennas

In the past you may have already seen an article by me in DARU Magazine about the construction of an antenna. That was a Delta run for 160 and 80 meters. A super antenna in a relatively small space, that is often used, and is really a solid antenna.

The antenna I want to show you now is one step better. It is an all-bander and has a wide footprint: the Terminated Three-wire Folded Dipole, abbreviated T3FD. The T3FD is a variant of the T2FD (the Terminated Tilted Folded Dipole) and, unlike the T2FD, has not 2 but 3 wires.



Good experiences

In a gray past (to be honest, I was a lot less gray then!) I had already seen this antenna hanging in the many broadcast areas that I had been assigned. Not only did I find the looks of the antenna special, but certainly also its characteristics. With such an antenna one could communicate with their homeland, but with a small adjustment, it also worked super well in the broadcast area as an NVIS antenna. As it is always important to have good 'comms' when it comes down to it; this antenna met those wishes and expectations.

When I got home I started searching the internet. There was quite a bit of information to I was missing, even for building instructions, and my search was incomplete. Stubborn as I am, I started to put something together myself. After long searches on the internet, with available data written down, and then materials collected, I was ready to proceed. During a group activity with the PA3EFR/J Scout group, I took the stuff along and put it together. With the well-known WD1TT (already described before as super material to use for an antenna), a number of PVC installation tubes and loose materials, we tried to build the antenna. This version was not worthy of the name T3FD: everything hung limp, we did not get the assembly tightly stretched, and the PVC pipe warped. In short, it was a flop!

We can do better!

Back home, I wasn't feeling well. For sure I had seen a good specimen in the field… I should be able to do that too! There is a company in Australia that builds and sells these antennas (not to private individuals by the way) and they did not provide a response, despite the fact that I had sent them email… times four. So, I had to keep experimenting myself; but isn't that part of our hobby? I started looking for something strong which would not bend in use, but is still feather-light. After some research, I came up with carbon. Carbon tubes, 10mm thick, with a wall thickness of 2mm. A godsend! This material weighs barely anything and fully meets the requirements and expectations. So now it was possible to build the antenna properly.

I invited my good friend Guido PD2GWE, and together in the front yard, started attempt number two.

I had already made some preparations. I had cut the carbon rods to size, prepared the insulators, put the end resistance together and assembled some loose parts. The brown strips are made of mica, which are excellent insulators and also very strong! Yes, we could start.

The hardest part is getting the three wires tight. We found that it is better to stretch the outer wires first and the middle one last. This makes it easier to attach the third and to get it tight *[right]*.

If you do it the other way around, the wire will sag, and you will not get the antenna tight!

It was a day with lots of trials, taking it apart, and reassembling but finally achieving the desired results. The antenna was finished. Of course, this antenna now hung at a height of only 1.5 meters, and it was questionable whether it would also be tight at a height of 15 meters. With the coax, it would add a significant amount of weight, so that it would likely continue to sag. But that was of later concern.

Right is a detail of the insulator at the end, where it is easy to see that the middle wire here is galvanically attached to the outer wire.

Because of the weight, a helper had to be placed in the middle where the antenna is fed, to prevent it sagging to the ground. This of course affects the SWR enormously, but there was no other solution.

A 1:9 Kelemen brand balun ensures a matching connection from coax to antenna.

Detail of how the WD1TT wire sits through the carbon bar. By cutting a small slot in the rod, the wire can be slid into it. To ensure that the rod does not shift, it is temporarily secured with tape. The tape will eventually weather, which is why I chose to inject some sealant into it later at the ends.

Testing

It was time to test. First, with an analyzer connected. The analyzer I like to use is the AA-600 from RigExpert. The beauty of this device is that you can connect a laptop, so that the much larger screen can provide a better overview of your measurement.

The measurement was done at a distance a bit away from the antenna. At first we didn't know what we were seeing. That is, we knew it, but we could hardly believe it. Measurement after measurement gave the same result. The measurement came down almost immediately and continued to fluctuate low for the entire range. I already knew that this was a good antenna, but that this is its characteristic was new to me.

Time to grab a radio. The motorized ATAS-120 antenna was unscrewed in the car and then the coax connected to the T3FD. Mind you, the antenna was still only at a low 2 meters from the ground, in some places supported by poles. Not ideal.

During the scan over the band I heard a familiar voice. PA3EFR was on holiday in France. He was in a QSO with a Canadian and we heard that station 5/9 too. We waited for an opportune moment to ask if one of the two stations could hear us? You can imagine the surprise in the voice of PA3EFR that he heard us on this QRG, just as he was testing his end-fed antenna at his campsite. The Canadian station also had no problem receiving us. Oh, what a nice feeling that gave! And that at such a low level of the antenna above ground.

What would the result be hanging high and free of support?

We tested that the next day. Between my main mast and a support mast the antenna was suspended at a height of 15 meters.

Tuning is not a requirement, but if you want to make the most of your power, then tuning is a nice extra.

With FT8 and GridTracker on, it is very easy to see where you are heard. The special thing about this antenna is that although it was oriented East-West, I could still be heard in South America with 5/9 reports. South America, North America and also Australia should not be a good path for this antenna from my location and an East-West setup.

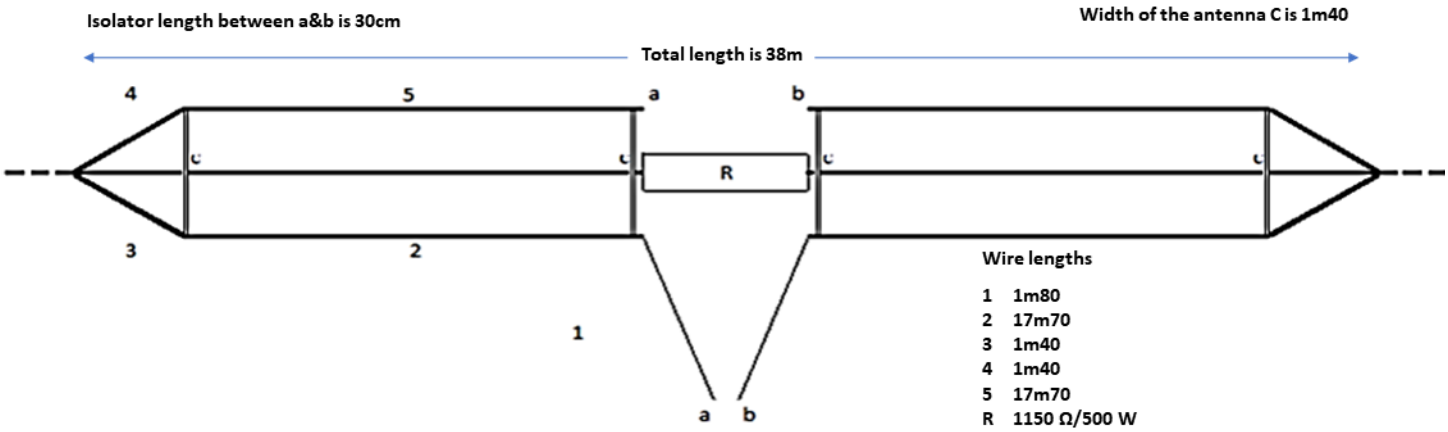
I am very pleased with what started as an unpredictable project. I immediately made two more for our field days and JOTAs that we do very often. The only disadvantage of this antenna is that packing and transport is very tricky. During our last event in Grave (see edition #21 of the DARU magazine) under the call PA82AD, we hung two, one North-South and the other East-West. Every band could be worked and we could be heard everywhere on the globe!

It could be even better!

Because I came across a lot of discrepancies on the internet, I needed to further contemplate the design. That was also based on the fact that I saw a very large version of this antenna in Iraq, and wondered if there is more that one can get out of it. So back to the drawing board I went. With the program MMANA-GAL that I have struggled with before, I thought: 'let's see if there was still something more to be gained'. It was not easy to get everything right in this program, but eventually, after many

hours in front of the fireplace, with the laptop on my lap, a so-called 'final version' was calculated. This had to be it. Now to find the time and good weather to build it.

Here is the final version. Because it is difficult to draw, here are some notes. The connection points a must be brought together. Use a length of wire measuring 1m 80cm (two pieces!).



This also applies to the connection points marked ‘b’. Between ‘a’ and ‘b‘ connect the 1:9 balun. In this way, the balun is suspended from the antenna.

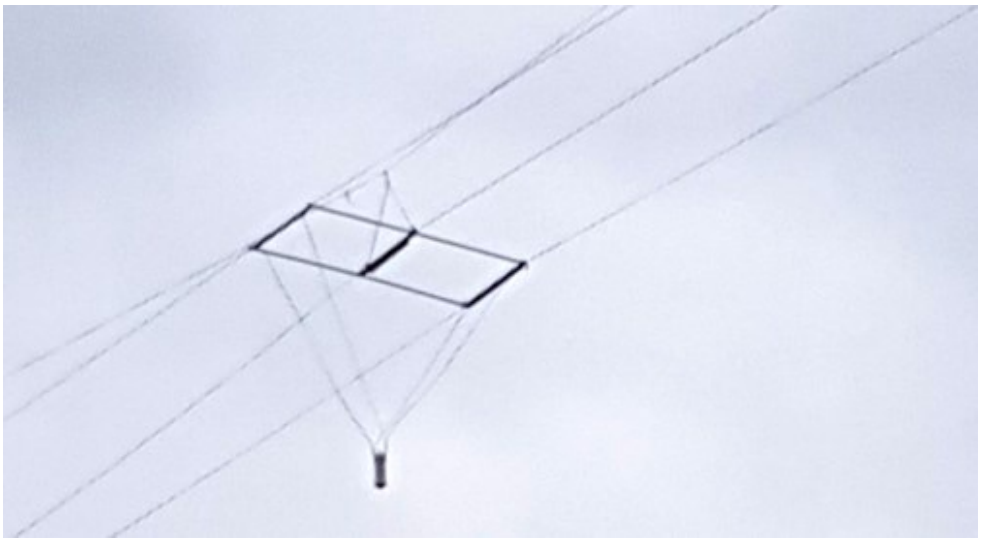
The insulators (a-b) have become 30cm long. This is because the terminating resistor of 1150 ohms consists of multiple resistors and has a length of 30 cm. The power of the resistor must be at least half of the maximum power applied. Various documents on the internet state that a third is sufficient, but from experience I know that this is not the case. With various holes in the insulator you thread the wires through it so that they no longer slide. At the point where length ‘3’ and ‘4’ join, all three wires are galvanically attached to each other. What we have done is created one long wire from connection point ‘a’ to connection point ‘a’ with the middle stripped bare.

The middle wire is attached to it, with everything neatly 'knotted' against the insulator *[see the detail photos on the previous pages]*.

When hanging it up, you think that the antenna is going to rotate along its longitudinal axis. But with the coax attached to it this will never happen. Even in storms, the antenna hangs neatly. At home I applied a support line because of the weight in the middle of the resistors and the coax. At 16 meters height, I stretched a line from one mast to the other, and the T3FD hangs from it in the middle. By fastening the ends of the antenna to the support masts it tensions the antenna and it hangs straight.

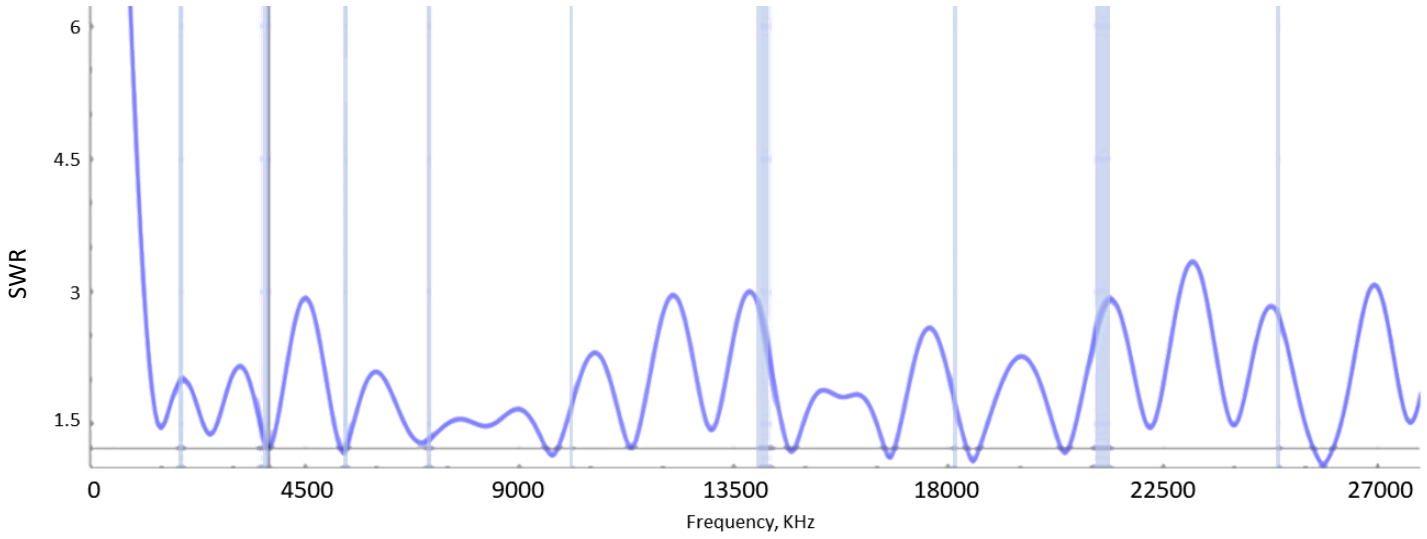
I also used clamps from WD1TT, as they have a tensile strength of 70kg per single line. With a wire tensioner it is very easy to apply a large force, and with a simple wrench you can increase the tension stroke by stroke until the antenna hangs very tight.

The lowest frequency at which the antenna must work can be set using the MMANA-GAL program. For this antenna I chose the 80 meter band. This allows the antenna to be as broadband as possible. Using the program it



Here is a detailed picture of how the antenna hangs at my location. The help line is visible above the antenna The help line does not affect the SWR by the way!

is also possible to set the height the antenna will hang. Because the masts in my garden are 16 meters, I chose to hang it at a height of 15 meters. That way I still had some room to fasten the help line. Through the program calculation I came to an antenna impedance (Z) of 450 ohms. By using a 1:9 balun the value is exactly 50 ohms. The transceiver likes it and you don't have to use a tuner.



An S5 noise level is common when listening to a signal with a normal antenna. With these antennas we have noticed that the noise level is significantly less, and drops to an S2 (sometimes even to 0).

The length of the antenna is fairly variable. A shorter, narrower or longer one is also possible, but of course there must be enough space for that.

[Left} It is a difficult to photograph antenna because the wire thickness is very thin. Hopefully it can still be seen.

[Right] Some pictures of the T3FD during our last field event working the call PA82AD. The two antennas are hung here at a height of 23 meters, one of which is above the water. Powered with RG142. This coax is nice and thin therefore lightweight. It can handle high power easily, has a very large frequency range, and relatively little loss.

Finally

I've already made a lot of connections with it… Worldwide! I often get a compliment about the strength of my signal. I have this antenna hanging horizontally, but in practice I have also seen one hanging with the power point high in a mast. Both ends are tensioned to the ground at an angle of 45 degrees. This gives you an NVIS characteristic and smaller geographic areas can be covered. In the war zone we could always get a connection from the helicopter to HQ on the HF bands. A good antenna!

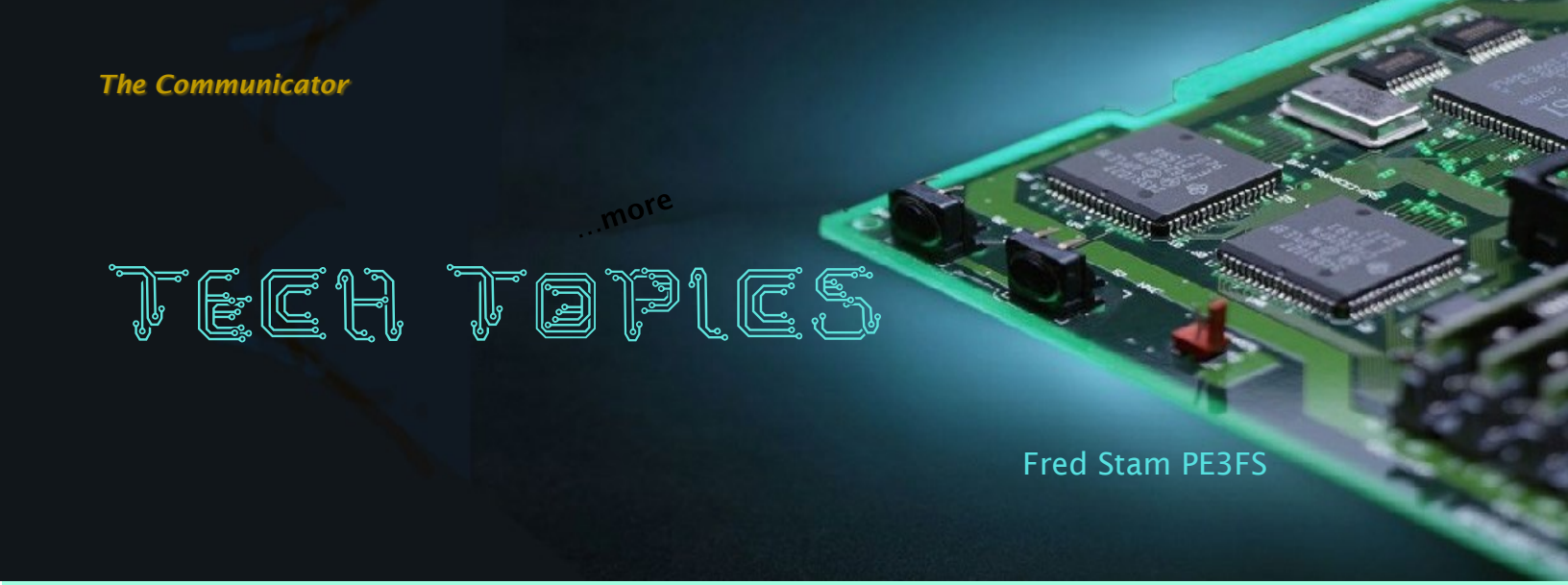
Because I could, I made another one. An extra mast has already been set up, and so I will soon be able to hang a second T3FD North-South, because I am still not heard much in Asia. This will take a while because I first want to put in a new main mast: a collapsible one 24 meters high.

That's where all the wire antennas will be anchored. As soon as I have done that, I want to do one more test: linking the two T3FDs together. Let's see what effect that has or whether it works at all. I will inform you as soon as the antennas are up.

If you have any questions about this antenna, do not hesitate to approach me. Send an email to pd9hix@hotmail.com

~ Sander PD9HIX

This article was translated and reprinted with the author's permission and first appeared in the magazine of the Dutch Amateur Radio Union (DARU), issue #22 https://www.daru.nu/



...more

TECH TOPICS

Fred Stam PE3FS

Connectors: Fact and fiction

"How can you tell the difference between a 50 Ohm and 75 Ohm BNC?"

This was the question I asked Google, and this is what I got in response: *"Notice that both 75 and 50 Ω connectors are similar; what changes is the inner dielectric, being the white part of the 50 Ω connector and the air in the 75 Ω connector. This dielectric gap causes them to have different capacitance, which causes the difference in impedance between them."*

I wanted a more detailed explanation of the question, so I started my search on the internet. I knew the answer, but the drawer in my memory in which I had it stored was closed. So, I couldn't reach it anymore or remember exactly how it was put together.

The reason for my question was a conversation I had on 2 meters with a fellow amateur about the impedance of a BNC plug. He told me it was the size of the gold-colored pin which would be larger with a 75 Ω plug. It started to bother me because I thought it was something else. I suspected it had to do with the dielectric. The internet is your friend, and after I'd worked through dozens if specs from factories... I turned out to be right. It had nothing to do with the cross-section of the pin but with the dimensions of the Teflon insulation. It may not matter but you're going to go down the wrong path without the correct information.

This article appeared in the journal of the Dutch Amateur Radio Union (DARU), September 2021.

Our thanks for permitting us to translate and publish this article. https://daru.nu

The applications are very different, but for 50 Ω we know it well, although I will expand on that later in this article. But 75 Ω is applied in video applications. There is even a 78 Ω and a 93 Ω variant that are used in air and space travel and are used for very specific tasks.

Below I will describe the most commonly used plugs.

BNC (Bayonet Neill Concelman)

Paul Neill worked at Bell Labs (now part of the Finnish Nokia) and Carl Concelman worked at Amphenol. That Neill also developed the N-connector is reflected in the fact that a BNC can slide just over the inside ring of the N connector. Useful for those occasions when you have no adapter. They are also called British Naval Connector and Berkeley Nucleonics Corporation but that is not correct. The Berkely Nucleonic Corp. is a company that manufactures high-quality measuring equipment and perhaps employs BNC plugs in their apparatus. The BNC plug was also used in military equipment, and maybe that's where the confusion lies. Such

	BNC specs 50 Ohm	BNC specs 75 ohm
Impedance	50 Ohm	75 Ohm
Frequency Range	DC - 4 GHz (DC -12 GHz on Extended Range Designs)	DC- 4 GHz (DC - 12 GHz on Extended Range Designs)
Voltage Rating	500 Volts RMS Max Continuous	500 Volts RMS Max Continuous
Dielectric Withstanding Voltage	1500 VRMS Max	1500 VRMS Max
VSWR (Return Loss)		
DC - 4 GHz	1.3 (-18 dB) Max	1.5 (-14 dB) Max
Insulation Resistance	5000 MΩ Min	5000 MΩ Min
Center Contact Resistance	1.5 mΩ Min	1.5 mΩ Min
Outer Contact Resistance	0.2 mΩ Min	0.2 mΩ Min
RF Leakage	55 dB Max @ 3 GHz	55 dB Max @ 3 GHz
Insertion Loss	0.2 dB Max @ 3 GHz	0.2 dB Max @ 3 GHz
Power Handling	316 W Max @ 1 GHz @ 25 ºC	316 W Max @ 1 GHz @ 25ºC

an assumption is quickly made. But if you want to call them that, go ahead, as long as we all refer to the same plug...

The BNC is based on a plug where the basic development had been done by O.M. Salati, who got the patent in 1951. Flaws and losses were minimized in his design.

TNC

Another member of the family with a different initial is the TNC connector. That stands for Threaded Neill–Concelman. This is one that you need to screw and is good to use from 0 – 11 Ghz. It has also been called the 'Threaded Navy Connector'. The thread of this plug in imperial (English dimensions) 7/16"-28. It was also developed by the above-mentioned duo Neill and Concelman. There is also an RP TNC that you will certainly know if you have ever had a wi-fi antenna mounted to a router. This is done specifically to prevent the consumer from having another antenna replace the supplied one.

RP here stands for reverse polarity. A bit of confusion but you see this more with antennas. For example, with two-way radios you also see reverse SMA, which will be discussed later. The TNCs are available in 50 and 75 Ω format.

N connector

The N-connector was, as mentioned, also developed by Paul Neill. It is a robust plug for greater power and higher frequencies. At first, they were only suitable up to 1 GHz, but now you can use them up to 11 Ghz. And I read that the latest modifications to the plug even make it usable up to 18 GHz. A beautiful and solid plug designed so that quite high power can be applied. There are many versions available but do buy a good brand because the Chinese brands often leave something to be desired in terms of quality. The metal layer with which they are finished sometimes peels off, and the dimensions are also inaccurate at times. So, buyer beware.

The SMA family

Some people pronounce it as 'sma' others pronounce the initials individually: S M A; either works. It's about the same as some people in phone saying something funny and then saying 'Hi-Hi' after that.

I just laugh when I think I'm saying something funny, it just seems more than clear to me that it is meant to be funny. Then I think: ! @#$%; but this is beside the point.

So SMA. SMA stands for Subminiature version A. This implies that there are other versions as well. And indeed: we know SMB, SMC, SMP, SMPM, SMZ, SSMA, SSMB and SSMC.

In the last three there is an extra S that stands for 'small', so the small subminiature plug version of A,B,C. They're the plugs that are attached to GPA antennas and for connections to semi-rigid coaxial wire. They all have their own frequency range, shapes and sizes. You can tighten the SMA plug with a torque wrench to a specific force, e.g. Mating Torque (Brass Plug) 0.3 - 0.6 Nm. Jos Disselhorst PA3ACJ even had a torque wrench for it. It's not mandatory though. A wrench works but don't over-secure it.

I found this information on the Amphenolrf.com site. There you will also find all specs of most of the connectors we use. It's a site that is worth browsing through.

For all connectors: to attach them you can crimp, solder or whatever. Just use the right plug for the right application. If you have no previous experience mounting a particular connector on a cable, check on the internet for instructions on exactly how to do it. Don't forget to slide a ring, screw ring, spacer or cover onto the cable first before you start stripping. We all know it and we forget it again just as quickly. If you find out later that you have forgotten them, very gently curse so that no one hears it, because it is embarrassing; I've also had that experience.

Come to think of it… that would be a nice section in this magazine: Stupidities of radio amateurs. Send your stupidities to the editor, we will publish them.

The Amphenol plug

Another name for this is 'pirate plug'. Probably because it was widely used at the time that there was pirating on 27 MHz. I don't know much about that because I was on the 3-meter band in the '70s of the last century. We used them there too, but I only came across the name pirate when I once spoke to an old 27 MHz pirate. It turns out there were two different worlds. Amphenol calls it UHF Straight Solder Plug. They also gave it a part number, but that does not

Amphenol connectors

The Communicator

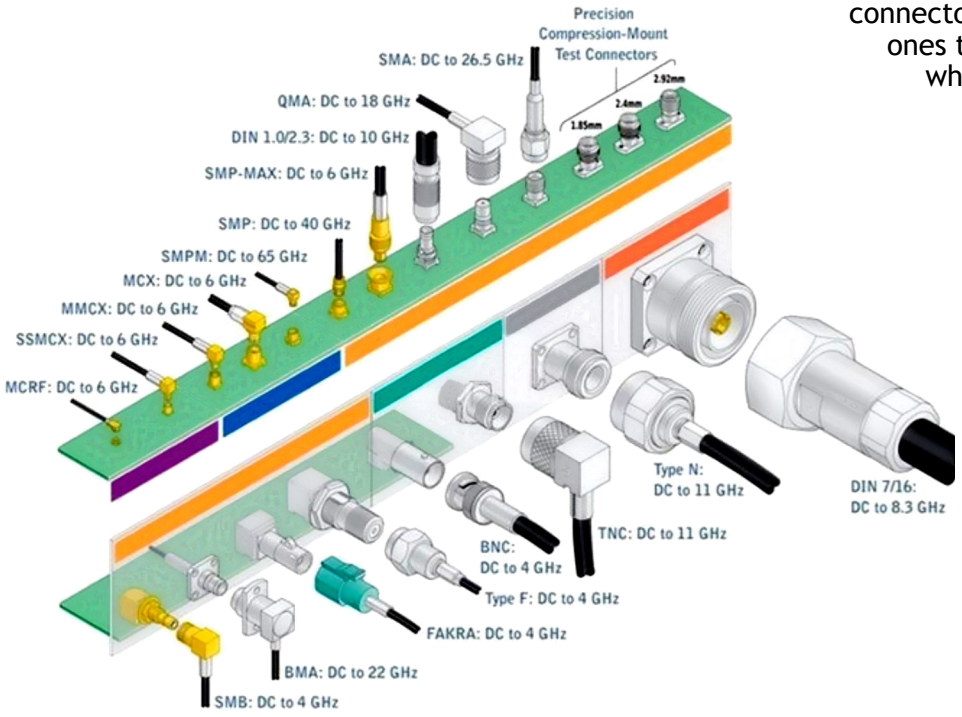
correspond to the number PL259 by which we commonly know it. PL stood for PLug and SO239 for SOcket, the chassis part. In the mariner's world, they call the plug a VHF radio plug; also a valid term.

What I also found on its website is that even Amphenol Corp. describes the impedance of this plug as inconsistent. Just so that you know that.

I think I have described the most common plugs for our hobby with the foregoing. But I have not yet come to the most important ones, namely the adapters between the various formats and the variations on them.

That is almost an impossible task because, even in the box where I keep them, I already have more than 50! For a number of them I have several, but I also have some fairly unique ones. I even have the first plug I ever bought at Hollander on the Bakenessergracht in Haarlem (Netherlands), and that was a silver-plated angled BNC plug. It was nothing special, but that was my first. Plus a chassis part for my DIY 3-meter FM transmitter for a schematic from Elektuur magazine. Five seconds for the plug... you know. That kind of nostalgia.

Special plugs are also used for demanding applications, such as the 7/16". Very large connectors that are used in the professional world. They can stand high power up to 3 kW and much higher peaks still. There are probably amateurs who use them but those are exceptions.



Of course, I have not described a lot of other connectors, but here are the important ones that we use regularly. There is a whole other story writing about plugs that are attached to microphones with all their different connections. But that's going too far.

If you think that I forgot one, don't hesitate to make that known to the editor. Let's write another column about all the exotic plugs that you use. But of course… send pictures.

73,

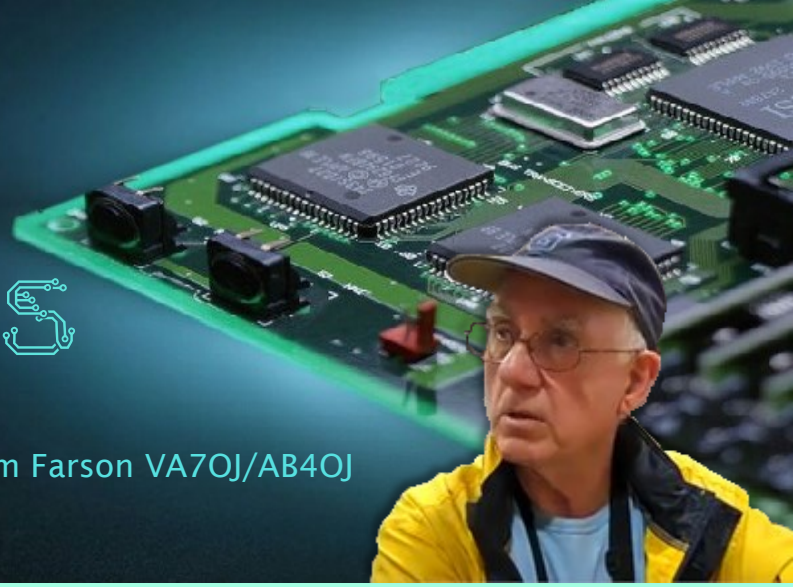
~ Fred PE3FS

Fred has a YouTube channel at [PE3FS]

The Communicator

...more

TECH TOPICS



Adam Farson VA7OJ/AB4OJ

What makes a good solid-state HF amp?

Introduction

A solid-state HF amplifier differs fundamentally in its design concept from a tube amplifier. Vacuum tubes operate at high anode voltages and moderate anode currents; typically, a tube PA (power amplifier) stage requires an RF anode load resistance of approximately 2000Ω for optimum efficiency. Modern tube amplifiers are single-ended, with one or more tubes. Multiple devices are connected in parallel; a tuned output tank circuit, such as api (or pi-L) network, is used to transform the load resistance to the nominal 50Ω load. A working Q of 12 ensures adequate harmonic suppression.

MRF150 matched pair. Click for datasheet.

The RF input circuit of a vacuum-tube amplifier may be either broadband or broadly-tuned. Grounded-grid configurations are most often encountered in modern tube amplifier designs.

The topology of a solid-state PA stage is quite different. The relatively low voltages and high currents required by the RF power transistors (typically 50V at 40A for a 1 kW amplifier) dictate a low collector (or drain) load resistance, of the order of 3Ω for a 250W PA module. The difficulty of matching the low impedances involved here to a 50Ω resistive loadover a wide frequency range has dictated a broadband,base-driven (or gate-driven) architecture, using ferrite-cored input and output matching transformers. A working Q of unity or less is not uncommon; these matching networks thus offer no harmonic suppression.

The output-transformer secondary expects to "see" a 50Ω resistive load. The input-transformer primary presents a 50Ω resistive load to the source over its entire frequency range; thus, tuned input networks are not required. The exciter always "sees" 50Ω resistive. It is therefore unnecessary to engage the transceiver's auto-tuner when driving a sold-state amplifier.

The **RF matching transformers** used in solid-state PA stages are wound on rectangular "binocular" 2-hole ferrite cores. Bifilar or trifilar windings made with miniature coaxial cable are used. These are designed in such a way that the series reactance and resistance of the windings is very small compared to the already very low RF load resistance, or input resistance, of the power devices.Ferrite cores must always be sufficiently large to avoid saturation at full RF drive or output. Such saturation is a major cause of intermodulation distortion. The transformer cores are thermally coupled to the heat dissipator, and/or mounted in the cooling-air stream, to remove heat caused by iron loss. *(Reference 4)*

The **PA stage** is always push-pull; this minimises even-harmonic generation. A matched pair of RF power devices is always used. Typically, a PA module (one pair of devices) is designed for 250W RF output; two modules are combined for 500W, and four for 1 kW. Each module is, in fact, a larger version of the PA stage found in popular "100W-class" HF transceivers.

In a 500W-class amplifier, a 3-port hybrid-transformer **power-splitter** divides the drive power equally between two 250W modules. A 3-port hybrid **power-combiner** adds the two module outputs to produce 500W. A 1 kW-class amplifier is made up of four 250W PA modules; the splitter and combiner are 5-port circuits.

The transformer construction in the splitter and combiner is as described above.

Why 3 and 5 ports? The splitter has 1 input and 2 or 4 outputs. Conversely, the combiner has 2 or 4 inputs and 1 output.

The combiner output is fed to a bank of bandswitched **low-pass filters** (LPF). These filters are designed to suppress harmonics and spurious emissions to levels required by radio regulations (typically –46 dBc or lower). The output of the filter bank is routed via the output T/R relay to a reflectometer, and thence via the internal auto-tuner (if fitted) to the antenna connector.

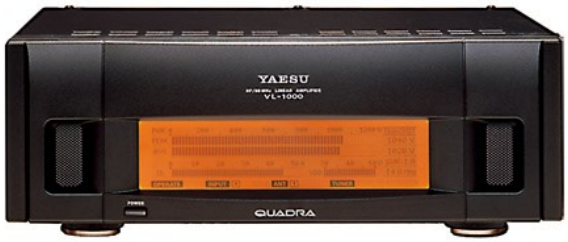
The splitter and combiner ports must be correctly terminated in 50Ω resistive. A mismatch can cause saturation of the transformer cores, leading to IMD degradation, and can also produce excessive dissipation in the hybrid balancing resistors.

The input connector is wired via the input T/R relay to the input port of the splitter.

For this reason, two to four push-pull modules (2 devices per module) with a hybrid splitter and combiner are the preferred topology.

So there we have it – the basic, broadband, no-tune (or self-tuning) solid-state HF amplifier.

The Yaesu VL-1000 solid-state amplifier



Note

Some inexpensive amplifier designs consist of one PA module with 4 MOSFETs in push-pull parallel. There are some concerns when connecting these devices in parallel, as their VHF power gain can be sufficiently high to send the parallel-connected pair into a self-destructive parasitic-oscillation mode. Paralleled MRF150's can break into oscillation at ≈ 450 MHz unless series isolating resistors (typically 2.7Ω) are connected in series with the gates. These resistors reduce stage power gain by a few dB. (Reference 5).

Now, we can ask: What makes a good solid-state HF amp?

The building-blocks of a typical solid-state amplifier are as follows:

1. PA stage, including cooling system
2. controller & protective circuits
3. ALC circuit
4. low-pass filter (LPF) box
5. auto-tuner
6. external interfaces
7. power supply unit (PSU)
8. exciter considerations

1. PA stage

Let us start here, at the heart of the amplifier. These are the qualities to look for:

- adequate cooling and duty cycle
- packaging: thermal electronic
- shielding
- linearity
- efficiency
- adequate power output
- power gain
- reduced-power operation (optional)
- QSK capability
- monitoring & protection features
- automatic band selection

Adequate cooling and duty cycle: The efficiency of a solid-state Class AB amplifier typically runs around 45 ~ 50%. Thus, the PA stage should incorporate a heatsink or heat-dissipator system capable of dissipating at least half the DC input power, whilst maintaining a safe transistor case temperature.

Typically, the **PA cooling system** should be designed to keep the device case temperature in the range 70 ~ 80ºC (158 ~ 176ºF) at 25ºC (77ºF) ambient, for a 30-minute SSB voice transmission or a 5- to 10-minute "key-down" CW transmission at rated output. These are minimal duty cycle values for an amplifier operating in average amateur service. Longer "key-down" intervals, necessitating larger heat-dissipating surfaces and greater air circulation, are required for contest operation or at high ambient temperatures. Some amplifier manufacturers specify the power-output rating as ICAS (Intermittent Commercial and Amateur Service).

The physical configuration of the amplifier's cooling system can be either a large, finned planar heatsink with fans blowing air across it, a cylindrical heatsink structure through which a fan moves a large volume of air, or a thermodynamic heat-exchanger. The latter is an innovative approach, in which the power devices are mounted on hollow blocks through which a refrigerant circulates. The evaporation of the refrigerant cools the devices, and the vapour is re-condensed by blowing cooling air through a finned condenser. This transfers the heat generated in the devices to the ambient air.

These forced-air cooling methods necessitate the use of one or more **fans**. One fan generally suffices at the 500W power level; a 1 kW amplifier requires two or three fans. These are usually DC-powered "muffin" fans. Excessive fan noise can be an issue with some amplifier designs. The prospective buyer should test the various amplifiers in a quiet environment, if possible, to judge whether the fan noise would be disturbing in the ham shack. Various fan-control schemes are in use; fans may run continuously, or only when the amplifier is keyed. In some designs, fans run at half speed in standby, and at full speed in transmit. Yet another option is to speed up the fans when the power-device case temperature reaches 50ºC (122ºF).

Packaging (thermal): In addition to adequate air-mover (fan) capacity, air intakes and outlets of sufficient area to ensure proper airflow must be engineered into the mechanical packaging of the amplifier. Any dust filters should be easily accessible for cleaning; an airflow detector (such as a vane switch) is an excellent refinement to the amplifier's protection system.

A solid-state amplifier must be fitted with over-temperature protection, which will reduce RF drive and/or initiate shutdown if the transistor case temperature exceeds the safe operating limit. This will be discussed in greater detail under Monitoring & Protection Features.

Packaging (electronic): All printed-circuit boards used in a solid-state amplifier must be top-quality FR4/ G10fibre-glass, with solder-plated tracks of sufficient width and thickness to carry the very high RF and DC currents encountered in the PA stage. PA board stock should be at least 3 mm thick. Low-inductance layouts should be used in all cases other than for on-board inductors. Push-pull circuits should exhibit a reasonably symmetrical layout. RF-component lead lengths should be as short as practicable.

Shielding: Each amplifier subsystem (PA stage, LPF box, auto-tuner, controller, power supply unit) should be totally enclosed in its own shielded compartment within the amplifier chassis. Power and control leads should enter these shielded enclosures via feed-through capacitors; RF interconnecting cables should have their braiding grounded at shield entry points. Lead dress should be observed.

These shielding measures will maintain RF integrity, minimise internal RF feedback, and ensure regulatory EMC (electromagnetic compatibility) compliance.

Linearity: Several factors determine the linearity of an HF "linear" amplifier: changes in device power gain (ratio of output to drive power) over the range from zero to full output, the collector/emitter BJT) or drain/source (MOSFET) peak RF voltage excursion, the regulation (stiffness) of the collector (+Vcc) or drain (+Vdd) supply voltage, the standing (idle) current and the onset of saturation in the RF transformers.

The limiting factor is the constancy of power gain over the entire power-output excursion. To visualise this, one can inspect the curve of output vs. drive power in the transistor data sheet. Generally, MOSFETs will exhibit superior linearity as compared to bipolar junction transistors (BJTs). MOSFETs such as the Motorola MRF150 began to displace BJTs (e.g. MRF448, 2SC2652) in the late 1990's. Newer MOSFET devices include the ST Microelectronic SD2931, SD2933 and SD2943.

The higher the voltage excursion, the longer the linear portion of the output/drive power curve. For this reason, amplifiers powered from 40V or 50V DC exhibit considerably better linearity, and thus lower IMD, than 13.8V units. Typical 3rd-order IMD (IMD3) values relative to PEP are –32 to -35 dB for 50V and –24 dB for 13.8V. Additionally, the much higher current requirements of a 13.8V design (typically 100A peak for 500W PEP) render power-supply design much more difficult

A solid-state amplifier must be fitted with over-temperature protection, which will reduce RF drive and/or initiate shutdown if the transistor case temperature exceeds the safe operating limit.

Extending this principle further, a tube amplifier, with its peak plate-voltage excursion of thousands vs. tens of volts, is somewhat more linear than any solid-state design (typically,IMD3 < -40 dB relative to PEP).

The collector-to-collector (or drain-to-drain) load impedance must be maintained as close to resistive as possible. This in turn requires optimising the wideband output transformer (s), combiner (if used), and low-pass filter passband VSWRs to as low values as possible. The load presented to the low-pass filter output must also be as close as possible to 50Ω resistive. Mis-termination of the low-pass filter will degrade the filter's amplitude/ frequency and phase/frequency response, and will also generate excessive RF voltages and/or currents which can cause serious damage. *(Reference 1)*

The exciter's IMD products will degrade the overall system IMD figure, as discussed here.

Efficiency: There is always a trade-off between amplifier efficiency (the ratio of RF output power to DC input power) and linearity. Solid-state amplifiers are generally operated Class AB (180° < conduction angle < 360°). This is a compromise between Class A (360°, most linear, least efficient) and Class B (180°, most efficient, least linear owing to crossover distortion). The devices are biased on to a standing current sufficient to minimise crossover distortion. It is possible to adjust the bias for minimumIMD3 by performing a 2-tone test at full rated PEP, and observing IMD3 on a spectrum analyser during the adjustment procedure.

As mentioned earlier, the efficiency of most solid-state HF amplifiers is approximately 45 ~ 50% at rated PEP. This compares favourably with many tube amplifiers, when one factors in the filament and screen power requirements of the latter.

Adequate power output: Solid-state amateur HF linear amplifiers generally fall into two power classes: 500W PEP and 1 kW PEP. All the current high-end offerings are “1 kW class”.

The power output is limited by the maximum ratings of commonly available RF power transistors, and by the linear operating region of these devices. The most cost-effective designs employ multiple devices rated at 150W to 250W output each. As discussed in the Introduction, the devices are arranged in groups of two or four push-pull pairs, each module being capable of 250W output.

In the 1980’s, popular 500W-class amplifiers used two pairs of BJT RF power transistors. The operating instructions recommended operation at 500W CW or PEP SSB output. Even though the 200W/device maximum rating offered some headroom, users were advised against exceeding 500W, as severeIMD3 degradation would result. In current 1kW-class MOSFET amplifiers, eight MOSFETs, each rated at 150W output, are arranged in four pairs. Headroom is somewhat less than for 200WBJTs, although IMD3 does not degrade quite as rapidly for Po > 1 kW. Typically, these amplifiers are comfortable at 1.0 to 1.1 kW PEP.MOSFETs have a higher cut-off frequency than BJTs, allowing full-power operation on 6 metres.

Power gain: This is the ratio of RF output to RF drive power. The system power gain of a given amplifier is the power gain of the PA devices minus the insertion loss of the input splitter, output combiner and output filters. The auto-tuner insertion loss must also be factored in, as applicable.

The power gain of any RF transistor decreases as frequency increases. This can be seen from the curve of power gain vs. frequency in the transistor data sheet. Typical values for system power gain at 14 MHz are 10 dB for BJTs and 12 dB for MOSFETs. This equates to drive power levels of 100W (BJT) and 65W (MOSFET) for 1 kW output. MOSFET power gain will typically increase by about 2 dB at 3.5 MHz, and decrease by 2 dB at 28 MHz (4 dB at 50 MHz). The frequency-dependent

power gain roll-off of MOSFETs is somewhat less severe than that of BJTs.

The "*good news*" for radio amateurs considering a solid-state amplifier is that a 100W-class solid-state transceiver will drive it to full rated output.

Reduced-power operation: Some solid-state amplifiers feature a "Low Power" setting which reduces the drain (or collector) supply voltage to lower the maximum output by 3 dB. This is preferable to merely reducing the drive power by the same amount.

The problem is that the limiting condition for reduced-power operation is the onset of crossover distortion, which will degrade system linearity. Crossover distortion is significant at low drive levels. In Class AB operation, the bias is set to provide the best compromise between standing current and small-signal linearity; some crossover distortion is inevitable at settings which hold standing current (and its resulting dissipation) down to acceptable levels. It is thus best always to drive the amplifier to a point near the top of its linear operating region, where Edd(p-p) is just less than 2Vdd. This increases the margin on the device transfer characteristic between the peak voltage corresponding to PEP and the point where crossover distortion becomes significant. Lowering Vdd will achieve this objective, whilst lowering the power output by the desired amount.

QSK capability: Some earlier solid-state HF amplifier designs used open-frame input and output T/R relays. These relays were somewhat too slow-operating to follow full-break-in keying much in excess of 10 to 15 wpm.

Current designs utilise miniature high-speed sealed relays, which are rated for a life of many millions of operations. Carrier-on timing in the exciter prevents "hot-switching" by delaying the application of drive until the relays have switched. This will prolong relay life. In addition, some designs provide a transmit-inhibit line to a compatible exciter. This line enables the RF drive only when all relays in the amplifier's signal path have settled after keying.

Some amplifiers also offer a feature which "exercises" all relays in the amplifier, low-pass filters and auto-tuner by operating and releasing them periodically when the amplifier is idle, but powered-up.

Monitoring & Protection Features: The PA stage is fitted with sensors that measure a variety of operating parameters, and forward their readings to the system controller (microprocessor or logic board). These parameters include DC supply voltage and DC PA input current (total and per-module), RF drive power, RF power-device case temperature, per-module output power and total forward & reflected power (at the combiner output, the LPF output and the auto -tuner output). The controller also drives metering functions. At a minimum, these should include the following:

- DC supply voltage
- DC PA input current
- RF power output
- load SWR
- ALC level

Reflectometers located between the PA combiner output and the LPF input, the LPF output and the auto-tuner input, and also at the auto-tuner output send forward- and reflected-power signals to the controller. These signals control auto-tuner settings; they also drive power-output and SWR metering and monitoring functions, and the ALC line. If the wrong LPF has been selected for the operating band, the reflectometer at the combiner output will detect high reflected power and signal the controller to shut down the amplifier. Likewise, if the load SWR exceeds the matching range of the auto-tuner (typically3:1 max.) the reflectometer at the auto-tuner output reports high reflected

power and signals the controller to lock the amplifier out. This feature protects the amplifier and auto-tuner against possible damage due to antenna-system failure.

At a minimum, the protection subsystem should detect the following anomalous conditions:

- over-current
- over-voltage
- over-temperature
- over-drive
- insufficient power gain
- power gain imbalance between PA modules
- wrong band (exciter and amplifier not set to the same band)
- excess forward power
- excess reflected power
- auto-tuner out of range (load SWR > 3:1)

There are two stages of protective action; automatic drive fold-back via the ALC line, followed by amplifier shutdown or lockout. For example, drive fold-back may commence for SWR > 1.5:1, with 3dB reduction in output at SWR > 2:1* and lockout at SWR > 3:1. This has the added benefit of reducing the impact of any increase in IMD due to the mismatch at the amplifier output. *(Reference 1)* Note that the drive foldback prior to lockout or shutdown also protects the amplifier's transmit/receive relays against **hot-switching** during a forced transition from the transmit to the receive/standby state.

* *In some designs, the controller signals the PSU to drop the collector/drain supply voltage to the "Low Power" value, thereby reducing output by 3dB for SWR > 2:1.*

Other protective features: Some amplifiers incorporate a simple, “brute-force” drive-limiting circuit in the RF input signal path. This serves to absorb initial RF power spikes generated by certain older exciters. Other designs provide a high-speed, high-current SPDT relay in the RF input signal path as an additional protective measure. Under lockout conditions, the controller will operate this relay to remove the drive signal from the splitter input and divert it to a 50Ω termination. *(In amplifiers which do not reduce the drive via the ALC line at the onset of anomalous operation, this relay will be hot-switched, shortening its life. In some cases, the relay may not open sufficiently fast to prevent damage to the power devices.)*

A *power attenuator* in the primary circuit of the input transformer or splitter stabilises the input load impedance and sets the PA stage power gain as required by radio regulations. In some amplifier designs, an additional attenuator is switched in to reduce unwanted RF output during the auto-tuner tuning cycle.

Automatic band selection is a feature of almost all solid-state amplifiers. This may be implemented in several ways; the exciter can supply coded band information to the amplifier via a proprietary protocol, or the amplifier’s controller can count the excitation frequency and thus determine the correct band. The band-data input is one of the amplifier's **external interfaces**.

Once the controller has determined the operating band, it selects the correct LPF for that band. In an amplifier with an internal **auto-tuner**, the controller also pre-sets the tuner to the setting last stored for that band. (If the controller is aware of the drive frequency, it sets the tuner to the previously-stored tuning point closest to that frequency.)

In general, care should be taken to avoid transmitting during a band-change or auto-tuning cycle, so as to allow the amplifier to drop back to the standby state once the cycle is complete.

2. Controller & protective circuits

Please refer to *Monitoring & Protection Features* (above) for details.

3. ALC circuit

Some form of ALC (automatic level control) should always be used to prevent driving the linear amplifier into the peak-flattening range - beyond its linear PEP capability. Excessive drive causes high IMD (splatter) on both sides of the signal. *(Reference 1, Chapter 14.)*

The ALC output feeds back a DC control voltage to gain-controlled IF stages in the exciter. This voltage is proportional to the amplifier power output. The ALC voltage is usually negative-going; the higher the voltage, the lower the exciter output (drive power). The purpose of the ALC is twofold:

(1) to limit the amplifier output to a preset level without causing distortion, and

(2) to reduce drive when the amplifier's protective subsystem detects an out-of-limits condition.

1. During normal amplifier operation, the controller derives the ALC voltage from the forward-power signal supplied by the reflectometer between the LPF output and the auto-tuner input. This is fundamentally different from the ALC derivation method used inmost tube amplifiers, in which the ALC voltage is usually derived from PA-stage grid current. In a tube amplifier, the ALC prevents overdrive by reducing the RF drive at the onset of grid current.

In general, the initial ALC attack time should be as short as practicable, to minimise overshoot. For SSB service, the ALC release time should be longer than the reciprocal of the syllabic rate ($t_{release}$ > 140 mS) to prevent the ALC from "riding" on voice peaks. For CW, the ALC release time should be longer than the longest element at the slowest keying rate, to ensure that the ALC loop does not follow keying. Typical values for voice-circuit use are: attack time 1 - 2 mS, release time 0.25 - 2 sec. *(Reference 2)*.

In Morse radiotelegraph (CW) service, the attack time should be even shorter (if possible) so as to minimise "thump" at the leading edge of the initial element due to ALC overshoot.

It is essential that the ALC attack and release time constants be so chosen as to ensure that the ALC loop does not follow the baseband or keying envelope and "modulate" the transmitted signal. Such spurious "modulation" can give rise to severe IMD and spurious products on both sides of the signal.

As mentioned earlier, IMD degrades quite rapidly if the design power rating is exceeded (IMD3 rises by 3 dB, and IMD5 by 5 dB, for every 1 dB increase in P_o over rated output.) To avoid this, the operator should adjust the ALC at the amplifier to hold the power output to the rated level. ALC should be adjusted in RTTY or CW mode, with the exciter's RF output control initially set at 100% (or 100W, whichever is less). The exciter's output should then be backed off to the point where the ALC just levels the amplifier's output at the rated value, as discussed.

2: Upon detecting any of the anomalous conditions described above, the controller will also develop sufficient ALC voltage to reduce the drive to a safe level. (For example, the reflected-power signal generated by the above mentioned reflectometer reports a load mismatch to the controller, which in turn folds back the drive via the ALC line.)

Proper connection and adjustment of the ALC is absolutely mandatory when using a solid-state amplifier. The ALC line is the amplifier's first line of defence. Failure to properly configure ALC will place the costly RF power devices (and other components) at risk of destruction.

Typically, a modern solid-state amplifier provides a negative-going ALC voltage in the range 0 to -10V. The ALC source impedance is approx. 10kΩ. At the amplifier's rated output, the ALC voltage is typically -4V.

Never connect a solid-state amplifier to an exciter not equipped with a compatible ALC input.

With the ALC correctly adjusted as per the amplifier manufacturer's instructions, the exciter's drive power control should be set *just at* the point where the amplifier delivers nominal power output, and no higher. This will minimise "ALC compression", and prevent overdrive in the unlikely event of ALC failure. (Reference 5)

4. Low-pass filter (LPF) box

This is the next component in the RF signal path. As mentioned above, the LPF box is a shielded enclosure containing a bank of bandswitched low-pass filters. These filters are usually Chebyshev networks, offering high attenuation and a steep roll-off near the cut-off frequency. They are designed to suppress harmonics and spurious emissions to levels required by radio regulations (typically –46 dBc or lower).

The filters are implemented using air-wound and **ferrite-cored** inductors, and low-loss, high-Q, high-current capacitors (e.g. silver-mica). One filter is provided per frequency band or range, and the filters are switched in and out of the signal path via miniature high-speed sealed relays. Cooling air is passed through the LPF box to remove heat caused by RF losses. The filter insertion loss is typically 0.5 to 1 dB in the passband.

5. Auto-tuner

Some solid-state HF amplifiers are fitted with an internal auto-tuner. This is typically a T-network, with capacitive series arms and an inductive shunt arm. The capacitive elements are motor-driven air-variable capacitors, whilst the inductive element is a combination of air-wound and ferrite-cored coils, with relay-switched taps. A reflectometer at the tuner input (and, in some designs, a phase comparator measuring the phase angle between the tuner input and output) signal an "optimum match" condition to the controller when reflected power is minimal and the input/output phase shift is exactly 180°. This stops the capacitor drive motors.

Another approach utilises a reflectometer and a return-loss bridge at the auto-tuner input. The controller initially reads the reflectometer for coarse tuning, then switches the return-loss bridge into the tuner -input signal path for fine tuning. The capacitor drive motors are stopped at the point of maximum return loss.

In some amplifier designs, the controller either bypasses the PA stage, or inserts a 20 dB attenuator in the PA-output signal path, to minimise interference to other stations during the tuning cycle.

Typically, the auto-tuner is designed to match load impedances in the range 16-150Ω resistive (load VSWR = 3:1 max.) Insertion loss is 0.5 dB when matched to VSWR < 1.5:1 at the tuner input. The auto-tuner is not intended to match highly reactive loads, such as non-resonant antennas; a suitable external tuner can be connected to the amplifier output for this purpose.

The auto-tuner **must be disengaged** when using an external tuner. Cascading tuners can reflect high reactance values back into the auto-tuner and/or LPF. As a result, dangerously high RF voltages can appear across capacitors in these networks, leading to component failure.

An internal auto-tuner in a 1kW-class amplifier requires some cooling, to remove heat generated by losses in the inductors and fixed capacitors. This is accomplished by a small fan in the auto-tuner compartment, or by the diversion of a portion of the amplifier cooling air through the tuner area. (For 1 kW

delivered to the load, with 0.5 dB insertion loss, the auto-tuner T-network dissipates 125W).

Depending on the controller design, the auto-tuner may either track frequency and load-impedance changes dynamically, orstore and hold settings previously established during a tuning cycle. The controller also switches taps on the inductor, and switches in fixed capacitors as needed for the lower frequency ranges. *(Reference 3)*.

The auto-tuner will also provide a certain amount of additional receive preselection.

6. External interfaces

In addition to the usual RF input, RF output (antenna), keying, **ALC** and power connectors, a solid-state amplifier is usually fitted with a "Band Data" input. This enables the exciter to send **band-selection** information to the amplifier controller. The band-data format is proprietary, and unique to each equipment manufacturer. In some designs, a reverse-keying line allows the amplifier to key the exciter, to request a carrier. The amplifier controller counts the carrier frequency to set the correct frequency range. This feature preserves automatic bandswitching when the amplifier and exciter are of different makes.

Many solid-state amplifiers offer dual RF input, keying and ALC interfaces, allowing the operator to switch between two exciters. Separate ALC adjustments are provided for the two inputs. In addition, up to four selectable RF outputs may be provided. These may be programmable, to permit automatic antenna selection by frequency range or band.

The **keying (PTT) line** in a solid-state amplifier is low-level, and is designed to be driven by an open collector or a light-duty reed relay in the exciter. No auxiliary keying relay or buffer is required. Some designs support **QSK** with a compatible exciter, via the keying line and a transmit-inhibit line.

Depending on equipment configuration, the external interfaces (other than power and RF) may be grouped in multi-pin connectors, to facilitate interconnection with the exciter. In addition, keying and ALC lines are usually brought out to RCA jacks.

7. Power supply unit (PSU)

The PSU may be internal or external; both linear and switching types are encountered. Generally, 500W-class amplifiers are sold with a companion 1.5 kVA linear PSU rated at 40V 25A output, whereas a 2.5 kVA switcher rated at 48V 50A output is provided with a 1kW-class amplifier. The PSU incorporates inrush-current limiting. Some 48V PSU designs allow switching to a lower output voltage (typically 35V) for half-power operation of the associated amplifier.

A well-designed PSU will incorporate extensive RF decoupling.

To ensure optimum linearity, the PSU must be well-regulated (approximately 5% output voltage drop at full load). A well-regulated collector/drain DC supply is essential to obtaining good linearity. It allows optimising the collector-to-collector (or drain-to-drain) load resistance for good efficiency and controlled current swing, without going into saturation.

The base or gate-bias regulator must be absolutely stable and free from RF or envelope modulation. Careful attention to the bias supply performance is necessary for the best linearity of which the power devices are capable. To reduce standing collector (or drain) dissipation in the RF power devices, bias voltage is applied only when the PTT line is in the transmit state. During standby, the devices are at zero-bias (non-conducting). RF-sensing electronic bias switching is not normally used in a solid-state amplifier.

Operation from 220 ~ 240V mains is recommended, to minimise the effects of mains-voltage drop. The PSU should incorporate an adequate forced-air cooling

system. A two-pole circuit breaker in the primary mains circuit is an excellent safety refinement.

A remote-control panel is a convenient operating feature offered with some high-end solid-state amplifiers.

8. Exciter contribution to system IMD when driving an amplifier

The contribution of exciter IMD to total system IMD is not all that significant unless the exciter exhibits severe IMD.

Let us run some rough "numbers" on a typical example - a 100W-class exciter driving a 1 kW solid-state amplifier:

The exciter output is 100W PEP, with -30 dBc* IMD3. This equates to 0.1W PEP IMD3 output.

The amplifier has 10dB power gain, i.e. 100W PEP drive yields 1kW PEP output.

Let us assume that the amplifier has -30 dBc IMD3 at 1 kW PEP output, i.e. the amplifier's IMD3 output to the antenna is 1W. Now, the amplifier's 10dB power gain amplifies the exciter's 0.1W contribution by a factor of 10, i.e. to 1W. If we assume that the IMD3 products are always additive (they may not be; they can also cancel each other), the total IMD3 power output from the amplifier is 2W, i.e. -27 dBc. This is still acceptable within the context of the example given.

In practice, amplifiers and exciters often yield better IMD figures than in my example, and amplifier power gains range from 9 dB (for some solid-state amplifiers) to as much as 18 dB (for some grid-driven tube amplifiers with a swamped input circuit). With a higher amplifier power gain, the lower drive requirement goes along with better exciter linearity. The bottom line is that the IMD3 contributed by the exciter may degrade the overall system IMD3 by anything from 2 to 6 dB in an average case.

** 0 dBc = composite PEP of two test tones of equal amplitude.*

Q: How much system IMD improvement can I expect with a Class A exciter?

A: In reality, not a great deal. Let us "run the numbers" again. Assume that the exciter output is 100W PEP, with -45 dBc IMD3. This equates to 3mW PEP IMD3 output.

As before, our amplifier has 10 dB power gain and -30 dBc IMD3 at 1 kW PEP output. Thus, the amplifier's IMD3 output to the antenna is 1W. Now, the amplifier's 10dB power gain amplifies the exciter's 3mW contribution by a factor of 10, i.e. to 30mW. If we assume that the IMD3 products are always additive (they may not be; they can also cancel each other), the total IMD3 power output from the amplifier is 1.03W, i.e. -29.8 dBc. This represents a theoretical 2.8 dB improvement over the Class AB exciter in the example above.

We now need to ask ourselves whether this 2.8 dB decrease in system IMD3 offsets the disadvantages of a Class A exciter (poor efficiency and much higher power dissipation, leading to increased risk of *catastrophic failure* in the exciter's PA stage.)

- An expanded and updated version of the above article has been published in the *ARRL National Contest Journal (NCJ), March/April & May/June 2018.*
- View typical examples of commercially-available solid-state amateur HF/6m amplifiers.
- "Solid-State HF/6m Power Amplifiers", presented at APDXC 2018.
- Look at biasing considerations for MOSFET RF power devices.
- Here are some common-sense rules for ensuring long PA life.
- Why I prefer solid-state amplifiers.

References

1. *"HF Radio Systems & Circuits", Chapter 12, Sabin & Schoenike, editors. Noble, 1998. View excerpt*
2. *"Single-Sideband Principles and Circuits" Pappenfus et al., Chapter 22, pp. 370-371. McGraw-Hill, 1964.*
3. *"Automatic Antenna Tuners & Couplers", by the author.*
4. *The ARRL Handbook for Radio Amateurs (2001), Chapter 6, Fig. 6.87.*
5. *Motorola Engineering Bulletin EB-104.*

Acknowledgements

- I am indebted to my good friend Matt Erickson KK5DR for encouraging me to write and post this article.
- Many thanks to Victor Besedin UA9LAQ for his excellent Russian translations of our amplifier articles.

Adam is a member of the North Shore Amateur Radio Club (NSARC), and has written a number of articles on a variety of subjects.

You can find them at Adam's website: https://www.ab4oj.com/

Adam Farson, VA7OJ/AB4OJ, 2022 Dayton Hamvention Award winner of the Technical Achievement Award.

Adam Farson, VA7OJ/AB4OJ, of West Vancouver, B.C., received the Technical Achievement Award for his dedicated professional work with RF and telecommunications engineering issues and innovation. He has been a ham since he was a teenager.

Best known to the amateur radio community for his development of multiple sources of technical support for Icom radios, Farson started an Icom technical support net on 20 meters in the 1980s. He and came to know several senior Icom Japan engineers while living in, and traveling around, Japan while working. With each week's net, Farson helped hams solve challenging technical and logistical issues.

Farson has spent 3 decades creating an online resource for HF radios. His website -- a repository for highly technical information on Icom and other HF transceivers and amplifiers -- is now one of the most widely cited internet resources.

He independently performs measurements on nearly all new radios, including noise-power ratio, a measure he developed. His work includes producing the only data radio hobbyists have, which clearly delineates how modern software-defined radios (SDRs) perform across the spectrum of band noise levels. Farson has written multiple articles for technical and amateur radio journals. Recently, he penned a multipart series on modern HF solid-state amplifier design principles.

~ Hamvention/ARRL

In an exchange of posts there was some discussion of the FCC rule which apparently limits the gain of a linear amplifier in the USA to 17.4 dB *[I was not aware of this rule but it would not appear to apply in Canada, or perhaps it has been changed in the U.S. - JB].*

Because these comments are also relevant to our Expert Linear 1.5kw amp, which utilizes a high gain single MOSFET power transistor, I have paraphrased the post below:

MOSFET amplifiers have large amounts of gain - 20dB is typical. Where are we supposed to measure this arbitrary FCC figure [of 17.4dB]?

To measure the gain, take the output power, divide by the input power, and take 10x the base10 logarithm of that. So a 1500W output from 27W of drive is: 10 log (1500/27) = 17.45 dB.

Anyone building one of these will realize that the big issue is to stop your exciter overdriving the amplifier and destroying the MOSFET(s). Actually, when the rule was first put into effect, it was mostly about two things:

1. It was hard, using vacuum tube technology, to get a LOT of gain without providing delicate neutralization methods to avoid that amplifier from turning into an oscillator.
2. The FCC wanted to prevent unlicensed CB operators from using ham amps to achieve ridiculously high power. With a 15 dB limit, a 5W CB radio would "only" produce about 150W. More than legal limit for CB, but probably not going to cause huge interference problems.

Of course, today it is possible to build a legal-limit amp that can be driven with QRP levels; this is exactly what Expert Amplifiers argued when they petitioned the FCC to change the rule.

Also, it is "strictly" illegal for an amateur amplifier to be able to output power (at least intentionally) in the 27 MHz unlicensed Citizen's Band, although anyone with sufficient technical skills could modify a commercial amp to circumvent this. (Unless the protection was done in firmware, i.e., sensing the frequency and inhibiting transmission through firmware code in the amplifier controller. I would think it's harder for an end-user to modify the firmware than any filter circuitry.)

Thanks to Rich K1EB for the foregoing enlightening discussion.

~ John VA7XB

...more

TECH TOPICS

...more

John Schouten VE7TI

Device protection: Fuses and circuit breakers

In today's electronics, fuses and circuit breakers play a very important role that is frequently misunderstood, with the result that expensive equipment is often not fully protected, and this can result in expensive repair bills. The generic function of a circuit breaker, or fuse, as an automatic means of removing power from a faulty system, is often abbreviated as OCPD (Over Current Protection Device).

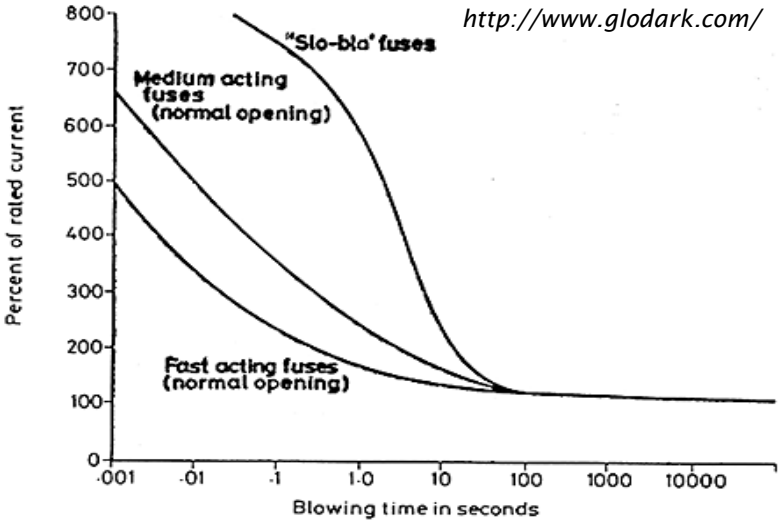
Fuses

The history of fuses is as old as the use of electricity and probably goes back to the time of the first short circuit! At first, fuses were simple open-wire affairs, but around 1890 Edison enclosed the wire into a lamp base to make the first enclosed fuse. By 1904 the Underwriters Laboratories had introduced specifications covering fuse size and ratings to meet the safety standards of the period. In 1927 Littelfuse started making the first of their range of low amperage fuses for the budding electronics industry. Since that time many new types of fuses have appeared on the market, some with very special characteristics for particular types of protection. Today the choice is extremely large and protection can be provided inexpensively and the risk of expensive repair bills reduced.

A fuse is a device which is wired into an electrical circuit to prevent excessive current flowing when a fault occurs. On overload the wire forming the fuse element will heat up and melt ('blow') thereby breaking the circuit, interrupting current flow, preventing damage from excessive current to the remaining circuits. It is the electrical equivalent of a "safety valve".

The most important characteristic to the user is the current rating which, unfortunately, is often misunderstood. The current rating of a fuse is established by the manufacturer after a series of tests under controlled conditions. This enables the manufacturer to publish a set of specifications for its product which design engineers can use to decide which is the correct type of fuse for a particular circuit. In order to understand the current rating of a given fuse it is important to know the conditions under which this rating was achieved.

Circuit breakers or fuses?



http://www.glodark.com/

There are three main groups of fuses:

- slow-blow (or anti-surge),
- normal quick acting, and
- very fast acting

There is also a fourth type known as time delay fuses.

Each of these types will protect a circuit from excessive continuous current, but act very differently under surge or short time conditions. The fitting of the wrong type could mean no protection at all is being provided, or fuses that keep "blowing" for no apparent reason.

Let's take a detailed look at each type in the graph above. The blowing time in seconds plotted against percentage overload for the three main types of fuse mentioned above is shown.

It can be seen that up to 100 per cent overload there is very little difference between the three types. But if we take a current overload of say 500 per cent we can see that the fast acting fuse blows in 0.001 seconds (a millisecond) and the slow-blow in about 2 seconds with the normal acting fuse at about 0.01 seconds. Quite a considerable difference between the three types. In fact the ratios (taking our normal acting fuse as the reference) work out at one tenth of the time for our fast acting fuse and 200 times longer for our slow-blow type! A very big difference indeed and more than enough to 'release the smoke' in expensive semiconductors under fault conditions.

Temperature also has an effect on the current rating. As the ambient temperature becomes lower the amount of current required to "blow" a fuse becomes higher and this can make a considerable difference to the blowing times under surge conditions.

Ah, you may be thinking, let's use a fast acting fuse all the time and be safe. Regretfully this is not practical as many circuits have a high surge current when first switching on, or switching to change operating conditions. [1]

Cartridge fuses

Let's consider the construction of a typical cartridge fuse. First it has to have a body or barrel and this is normally made of glass or ceramic material. The barrel will have some form of termination at each end, usually brass or copper, which has been plated to prevent corrosion. The fuse element will be connected between the two end terminations and enclosed within the barrel.

It will consist of a single wire in the case of a quick acting fuse, or may be one or more wires arranged in a specific way for delay and anti-surge types. Sometimes a filler is used to modify the action of the fuse and this may be sand or quartz powder. This filler will absorb the energy of the arc when the current is interrupted.

[1] http://www.glodark.com/

Fuses are of course marked in some way as to type and ratings, normally on one or both of the end caps and in addition there may be an indication of one of the many standards that the particular fuse complies with, e.g. BS, SEMKO, etc. The size of fuse may vary but there are a number of standard sizes and the most common are the Standard metric which is 20mm long by 5mm diameter and the US standard of 1 x .25 inch diameter. Many other sizes are available ranging from 5mm long to over 200mm.

Blade fuses

Automotive 'blade' fuses are a class of fuses designed to protect the wiring and electrical equipment for vehicles. They are generally rated for circuits no higher than 32 volts DC, but some types are rated for 42-volt electrical systems. They are occasionally used in non-automotive electrical products.

Blade fuses, also called spade or plug-in fuses, have two specific characteristics:

- Readily identifiable through colour coding.
- There are seven most common fuses - 5, 7.5, 10, 15, 20, 25, 30 Ampere.

They are easily inserted into spade lugs, either in a fuse block or in a separate wire fuse holder. They are offered in various sizes and ratings *[see graphic below]*.

Developed by Littelfuse for the automotive industry, the blade fuse has become the original equipment circuit protection standard for foreign and domestic automobiles and trucks.

Be careful of inexpensive Chinese versions. There are often rated inaccurately and have a tendency to come apart in use, particularly if the fuse becomes warm in high current use. Better versions have silver plated contacts to minimize resistance and corrosion.

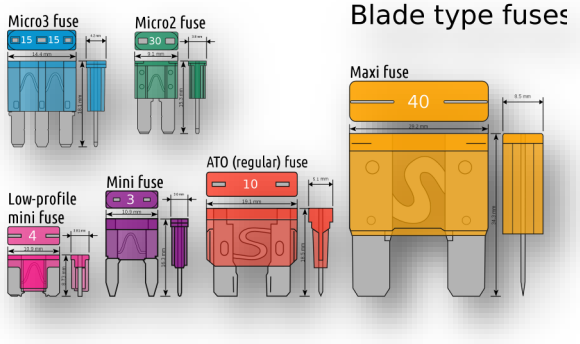
Fuse Characteristics

There are two main characteristics which will concern the Amateur and these are maximum continuous current rating and the surge rating of slow-blow types. The rupturing capacity of a fuse may also be important and for completeness is mentioned here. A high rupturing capacity fuse is capable of interrupting currents in the order of thousands of amperes. It would have a ceramic body and also contain an arc-quenching medium. Non-HRC fuses (more common in Amateur Radio equipment) do not have an arc-quenching medium and are only suitable for surge currents up to about 50 amps. With higher currents than this they would be very likely to explode when they blow.

Fusing Speed

As we have seen, a quick-acting fuse is designed to react both to short and long term overload conditions. They are very robust in construction and will withstand shocks and vibration. But they do tend to have a higher resistance and the voltage drop caused by this may be a problem in some applications. This higher resistance also means that more heat is produced and this must be effectively dissipated.

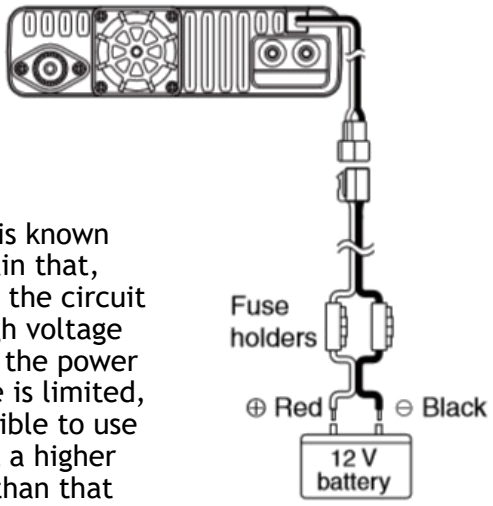
Color	Current rating
Dark blue	0.5 A
Black	1 A
Grey	2 A
Violet	3 A
Pink	4 A
Tan	5 A
Brown	7.5 A
Red	10 A
Blue	15 A
Yellow	20 A
Transparent	25 A
Green	30 A
Blue-green	35 A
Orange	40 A
Red	50 A
Blue	60 A
Amber/tan	70 A
Transparent	80 A
Violet	100 A
Purple	120 A



Blade type fuses

Time delay fuses will react to long term overload currents but will withstand transient surges without harm; several types are available. For example, one type has what looks like a spring inside the barrel and these will stand up to surges of around ten times the normal rating for 75 milliseconds. Another type has a "blob" in the middle of the fuse element and this type has a reduced surge capacity, typically ten times rated current but only for 25 milliseconds. Time delay types have a very low resistance and can be used in enclosed places as there is little self-generated heat but they are only available in the lower current ratings. Both the "spring" and the "blob" type are time delay fuses.

So far we have mentioned only the current rating of fuses, but they also have a maximum voltage rating. This voltage rating has no effect on the current rating but is important nevertheless. When a fuse "blows" an arc is developed between the two ends of the broken fuse element and, if the voltage across these ends is high enough, the arc will be maintained and the current will not be interrupted. This condition could result in considerable damage to the equipment. Arcs are readily produced in high voltage circuits or where inductive loads are being used and, in these conditions, the voltage rating of a fuse must not be exceeded. Fuses can be used at their current rating at all voltage levels up to their maximum.



When it is known for certain that, although the circuit has a high voltage present, the power available is limited, it is possible to use a fuse at a higher voltage than that for which it is rated. This is common practice in domestic electronic equipment and quite safe. But. if in doubt, keep within the voltage ratings given by the manufacturers.

Amateur Radio fuse applications

Always place the fuse as close to the battery as possible. If for any reason the positive wire's insulation is damaged and the wire touches the chassis or engine (a hot manifold is a frequent cause of this problem) then it will blow the fuse if it is close to the battery but not if it is between the radio and the short.

One fuse or two? Some people are questioning the practice of fusing both DC power leads, while others are vigorously defending it.

For example, there is a lively eham.net discussion here. Ed/W1RFI provides some useful insight on the ARRL forum. Alan/K0BG covers the topic of DC power on his wiring and grounding page. Tom/W8JI argues for the one fuse approach on his website.[2]

[2] Thanks to Bob K0NR for his article: 'Mobile DC Power: One Fuse or Two?'
[see next pages]

Until recently amateur radio fusing was explained in one sentence: "Place a fuse in both lines." This means that it's good practice to place a fuse in the negative line. After all, most manufacturers recommend this as shown in the diagram above. Many hams think that is unnecessary because you will not cause a short if the negative wire touches the metal of the vehicle. So why place a fuse in this line? In many installations the negative wire goes straight back to the negative terminal of the battery. If the battery cable develops resistance between the cable and the body of the vehicle by rust or corrosion or the wire itself corrodes to the point that it is not a good conductor this type of installation can cause problems. When the engine is being started a lot of current is being drawn from the battery and the wiring to the mobile radio is not designed to handle any where that much current. Simple Ohm's law will tell you that the maximum current will flow through the path of least resistance and if that path happens to be through the negative wire of the radio to the negative terminal of the battery then that is the where the most current will flow. Frequently the unit is not grounded well at the mounting bracket but the shield side of the coax makes a good ground by the antenna mount. In that case the current for the starter will attempt to flow through the coax shield to the coax connector on the radio then on to the negative wire to the battery. If that wire is not fused the coax shield will smoke. If the radio is grounded at the mount, the negative wire to the battery is not big enough to handle the load and it will smoke. Either way there is a fire danger.

This type of hookup is not recommended. If you do this and the fuse blows you may not know it is blown because the radio finds sufficient contact between the mounting bracket and/or the antenna ground to continue to operate. The resistance between the battery and the vehicle chassis does not have to be high enough that the vehicle will not start to cause this phenomenon. The antenna ground and the mounting bracket are not designed to be the negative source for the DC power of the radio and it will cause more problems than you can imagine. Tracing the source of these problems can drive you crazy. The suggestion is therefore to run the ground wire to the chassis of the vehicle. Use an eye terminal with one outer locking lock washer between the head of the screw and the lug and another between the lug and the chassis. Scrape the paint off the place where the lug will come in contact with the metal. Run the screw down tight but do not strip it out.

Alan/K0BG has an excellent website that provides guidance on mobile radio installations. He points out that modern vehicles usually have an Electrical Load Detector (ELD) inserted into the negative lead of the battery, so that the vehicle control systems can monitor the state of the battery. It is important to connect your radio on the "other side" of the ELD, near where it connects to the vehicle chassis. Oh, and never use the existing vehicle wiring to power your radio (especially not the 12 V accessory plug).

Corrosion and resistance

The resistance of a fuse is usually an insignificant part of the total circuit resistance. Since the resistance of fractional amperage fuses can be several ohms, this fact should be considered when using them in low-voltage circuits. Most fuses are manufactured from materials which have

For a video on how to replace a blown automotive fuse
http://www.videojug.com/film/how-to-replace-a-blown-fuse

positive temperature coefficients, and, therefore, it is common to refer to cold resistance and hot resistance (voltage drop at rated current), with actual operation being somewhere in between.

Cold resistance is the resistance obtained using a measuring current of no more than 10% of the fuse's nominal rated current. Hot resistance is the resistance calculated from the stabilized voltage drop across the fuse, with current equal to the nominal rated current flowing through it.[3]

The user should be careful that corrosion can occur at the fuse connections to the holder. At high current, such as when transmitting, significant voltage drops can occur, even at relatively low connection resistance. Always solder wire connections when an after-market fuse holder is installed and frequently check for loose lugs or fittings where the fuse is fitted.

Fuse ratings

Fuses are sensitive to changes in current, not voltage, maintaining their "status quo" at any voltage up to the maximum rating of the fuse. It is not until the fuse element melts and arcing occurs that the circuit voltage and available power become an issue.

To summarize, a fuse may be used at any voltage that is less than its voltage rating without detriment to its fusing characteristics. You can use Ohms Law for power to determine the current rating required. Amperage is determined by Watts /Voltage so, for example, if the wattage is 150 and you are running it on 12 volts, it is 150/12, or 12.5 amps.

Circuit breakers

A circuit breaker is an electrical safety device designed to protect an electrical circuit from damage caused by an overcurrent or short circuit. Its basic function is to interrupt current flow to protect equipment and to prevent the risk of fire. Unlike a fuse, which operates once and then must be replaced, a circuit breaker can be reset (either manually or automatically) to resume normal operation.

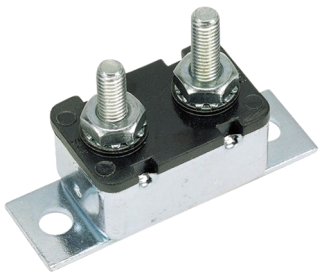
An early form of circuit breaker was described by Thomas Edison in an 1879 patent application, although his commercial power distribution system used fuses. Its purpose was to protect lighting circuit wiring from accidental short circuits and overloads. A modern miniature circuit breaker similar to the ones now in use was patented by Brown, Boveri & Cie in 1924. Hugo Stotz, an engineer who had sold his company to BBC, was credited as the inventor.

To make a selection on which automotive circuit breaker is best for your application, you must consider where the circuit breaker will be mounted, the current rating you need the electrical breaker to carry, and the type of reset method. There are four electrical circuit breaker types:

1. Auto-reset circuit breakers

These connect to your electrical system via two metal studs. One stud is silver and links to the battery side of the wire. The other stud is bronze and connects closer to the electrical appliance. This breaker type has an electrical contact, which bends when heated, thus cutting off power.

It acts similar to standard home breakers, which automatically trips when the temperature rises due to an overcurrent. However, unlike home breakers, you don't need to reset them manually when they cool down.



But despite being auto-reset, it will still protect your

[3] Courtesy of littlefuse

electrical system. When there's a fault, the auto-reset circuit breaker will trip continuously. If that happens, you have to look at your wiring system and other connected components to correct the issue.

Watch this video by *'How 2 Wrench'* to see how an auto-reset circuit breaker trips and resets. With his simple setup, you can see what actually happens inside the breaker when he introduces a short in the system.

Other Types of Automotive Circuit Breakers

Aside from the auto-reset circuit breaker, there are two other types of automotive breakers as well. More about these breakers as we explore them below.

2. *Type 2 Manual Reset Circuit Breaker*

The manual reset circuit breaker works similarly to the auto-reset breaker. The main difference is that once it trips, you have to reset it manually. This is suitable for sensitive electronic components, as it will not continuously cycle through power-on and power-off states.

3. *Type 3 Push-To-Trip Circuit Breaker*

This push-to-trip circuit breaker has a manual test button that intentionally lets you trip the circuit breaker. Typically, it comes with a lever indicator showing the circuit breaker status. Push the lever back to its place to reset this circuit breaker.

This is perfect for systems that you want to control manually. It's also ideal for safety if you're working on electronics, ensuring the battery is physically disconnected from your appliance via the breaker.

A typical automotive accessory/stereo circuit breaker

As in fuses, circuit breakers are made in varying sizes and current ratings. As stated previously in this article, contact resistance caused by loose, sloppy connections or corrosion are a major factor in poor transceiver performance, particularly at higher power levels such as in HF. Ensure all connections are tight. These devices are not recommended for low current devices however. Their low current draw makes resistance issues less critical and circuit breakers are generally not available for low current devices. Small accessories are better served by using a fuse of an appropriate rating.

Fuse holders

Lastly, considerations for wire fuse holders… Regardless of fuse or circuit breaker application, wiring should be of the appropriate gauge and of minimum length required. For transceivers this is normally stranded 14-gauge, and perhaps 12-gauge for HF applications depending on current draw. There is a handy calculator at: Wire Size Calculator (wirebarn.com).

If you intend to use a fuse holder outside, ensure that it is waterproof. Many blade fuse holders have a rubber cover for this purpose.

Check for corrosion and loose connections on a regular schedule to avoid issues with high contact resistance.

I'm often surprised by the poor wiring practices of some who may not know better. Many issues related to poor transceiver performance are not the fault of the unit's design, but by inadequate power source. Hopefully this article has provided you with enough information to avoid the common pitfalls.

~

Mobile DC power: One fuse or two?

Bob maintains a great blog site at https://www.k0nr.com/wordpress/.

Contact Bob at bob@k0nr.com.

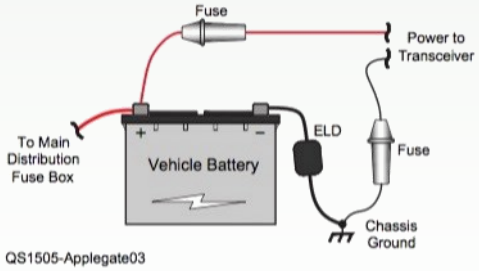
You can also check out his book VHF, Summits and More: Having Fun With Ham Radio.

Sometime during the 20th Century, I learned that fuses (or circuit breakers) are used in electrical circuits to prevent catastrophic failure. Fuses open in response to an electrical fault that causes excessive current to flow. The job of the fuse is to minimize the damage and keep things from catching on fire. When I started installing amateur transceivers into vehicles, I learned that you should connect wires directly to the car battery (or darn close) and you should fuse both the positive and negative power leads. I was surprised by the need for two fuses, but there are technical arguments for it. Besides, the transceiver manufacturers recommend it in their manuals. *[see figure below]*

I am focusing this discussion on a typical 2m/70cm FM transceiver installation – that is what I have the most experience with and that is the most common ham mobile installation. Such a radio typically draws ~10 A on transmit, so the DC power is usually fused with something like a 15 A (or 20 A) fuse. Keep in mind that a 15 A fuse is not going to protect delicate circuitry but might stop more serious damage or fire.

Connect To The Battery?

Alan/K0BG has an excellent website that provides guidance on mobile radio installations. He points out that modern vehicles usually have an Electrical Load Detector (ELD) inserted into the negative lead of the battery, so that the vehicle control systems can monitor the state of the battery. It is important to connect your radio on the "other side" of the ELD, near where it connects to the vehicle chassis. Oh, and never use the existing vehicle wiring to power your radio (especially not the 12 V accessory plug).



The negative power lead for a transceiver power should be connected to the chassis side of the ELD. Figure: k0bg.com website.

One Fuse or Two Controversy

Recently, I became aware of controversy with regard to proper fusing. Some people are questioning the practice of fusing both DC power leads, while others are vigorously defending it.

For example, there is a lively eham.net discussion here. Ed/ W1RFI provides some useful insight on the ARRL forum. Alan/ K0BG covers the topic of DC power on his wiring and grounding page.

Tom/W8JI argues for the one fuse approach on his website.

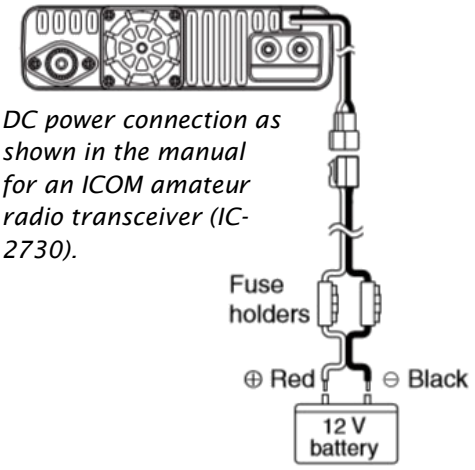
What Do The Manufacturers Say?

Generally, you should follow the advice of the manufacturer on any equipment installation, so I took a look at a few owner's manuals. Most (or all?) of the manuals for the amateur gear show the two fuse method. See the ICOM example *[right]*. Note that they don't show the presence of the ELD.

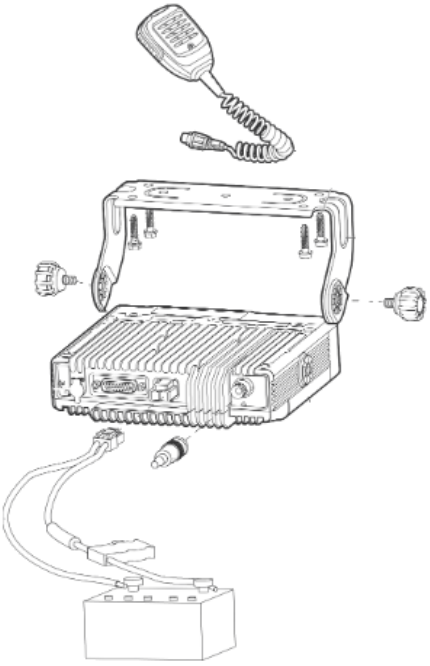
I also took a look at some commercial land mobile radio manuals. Motorola shows the single fuse approach. Hytera also shows a single fuse in its land mobile manuals.

ICOM makes both amateur and commercial land mobile gear, so I wondered what they recommend for their land mobile product line. Ha, funny thing, they show two fuses, with a comment that says, "Depending on version, the fuse holder may not be attached to the black cable." *[diagram next page]*

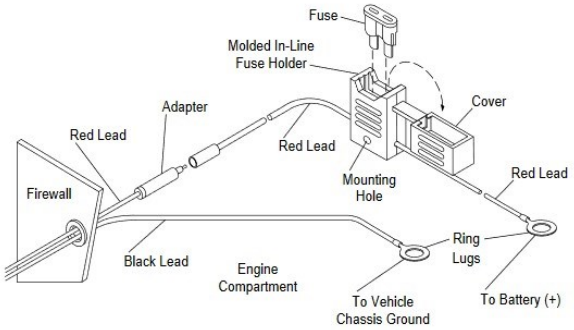
Well, isn't that special?



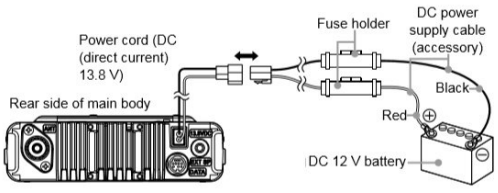
DC power connection as shown in the manual for an ICOM amateur radio transceiver (IC-2730).



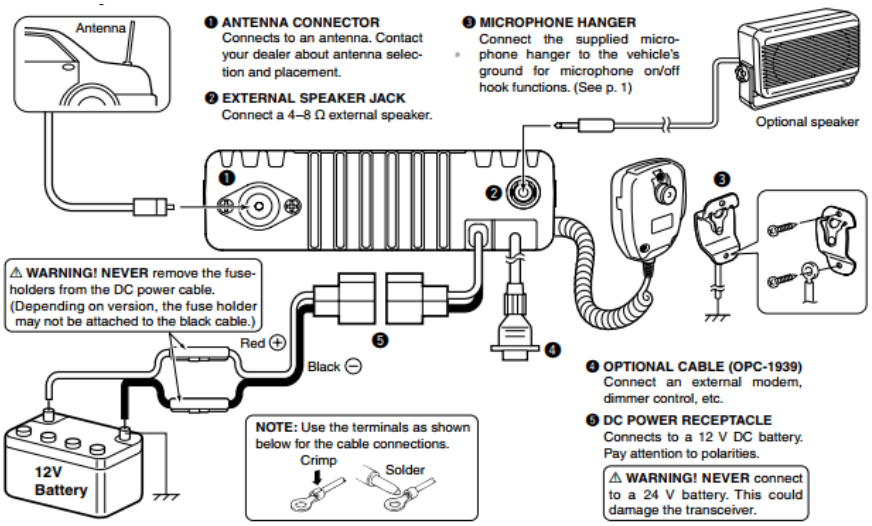
DC wiring diagram from a Hytera land mobile manual.



DC power wiring diagram from a Motorola land mobile manual (CM200- 300).



DC power wiring diagram for a Yaesu amateur radio



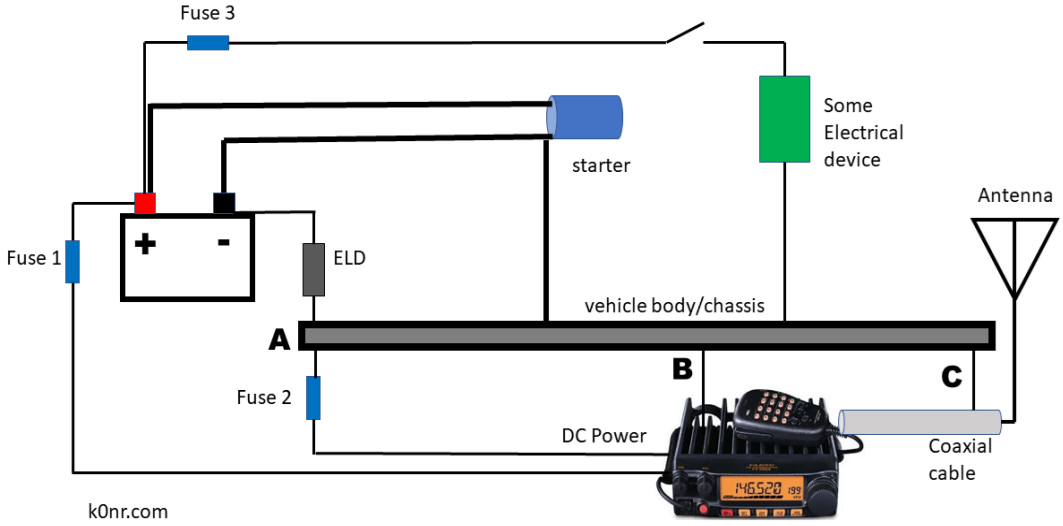
ICOM land mobile transceiver wiring diagram shows two fuses but says the negative one may not be there. (IC-F5021 manual) . [click to enlarge]

So is the two-fuse thing some kind of ancient amateur radio practice and the land mobile industry has gone a different path? Sometimes industries adopt "standard" approaches and then forget why with time.

Some Circuit Analysis

After reading through all of the arguments, I tried to distill them down to their essence. I created a wiring diagram *[below]* that may help explain the concepts. Or maybe not. An automobile is a complex electrical and electronic system, so any practical diagram risks oversimplifying the situation. But here's my best shot at it.

The center of the diagram shows the body/chassis of the vehicle which is connected to the negative lead of the battery, through the ELD. The transceiver is directly connected to the + terminal of the battery (via Fuse 1) and the chassis side of the ELD (via Fuse 2). The engine starter is connected to the battery with heavy cables and is also connected to the body/chassis. While there are a large



Wiring diagram for radio transceiver installation, including some major vehicle components. [click to enlarge]

number of other electrical devices in a modern vehicle, only one is shown here as an example (with a switch and fuse).

The circuit shows the antenna connected to the radio with a coaxial cable. The shield of that cable is almost always grounded to the vehicle chassis at the antenna. (Magnetic mount antennas are one exception and I am sure there are others. Update: Ron N0IVN pointed out that the on-glass antennas are not grounded.) I can say that every mobile installation I've ever done had the coaxial cable connected to the chassis. This is an important point because it provides a chassis connection for the transceiver at point C (whether you wanted it or not). There may be other ways that a transceiver is connected to chassis (point B), including the mounting bracket, external speaker, microphone or other accessories.

Arguments For and Against

The argument for fusing the negative lead is to protect against return current from other devices that find its way back to the battery through the transceiver's negative power lead. For example, the starter could have a fault in its negative cable, causing the current to flow through the chassis to the transceiver and back to the battery. The starter current can be hundreds of amperes which would likely overload the radio wire which is sized for 15 amperes. The fuse will open and protect the negative lead (and maybe the radio, to some extent).

The argument against fusing the negative lead is that if the fuse opens up, it could cause problems. Suppose Fuse 2 opens up due to some transient condition. If the transceiver is completely isolated, Fuse 2 would remove power from the transceiver. However, the return path at the antenna coax (point C) will most likely allow the radio to continue functioning using the coax as the negative return. Typically, this is RG-58 or similar cable, which is not intended to carry significant DC current and may fry under the load. If the current is coming from a fault in the starter wiring (big current), this is going to be a bad day for your mobile.

My Conclusions

I think both arguments have merit but choosing one fuse or two requires estimating which problem is most likely and judging the overall impact of the fault. The negative lead fuse can do only one thing well: protect the negative lead. It might provide some protection to the transceiver but there are a lot of sensitive circuits inside the radio that will get destroyed with 15 A flowing. Again, the connection at point C means that the radio will be connected to chassis and current can flow.

If Fuse 2 is eliminated it allows for the flow of high currents through the negative lead of the transceiver. This is not desirable but is it better or worse than the current flowing through the coax shield? Probably better. If a high current device (the starter) has a wiring failure that dumps large currents into the chassis, it may find a number of return paths. Lots of current is going to flow somewhere and potentially cause damage, with or without a negative lead fuse.

This book is an easy-to-understand introduction to VHF/UHF ham radio, including practical tips for getting on the air and having fun messing around with radios. Learn about FM, SSB, repeaters, equipment, band plans, phonetics, portable operating, Summits On The Air (SOTA) activations and more.

I will note that bonding the transceiver to the vehicle chassis has some benefit (point B in the diagram). You may or may not have this connection depending on how you mounted the radio. This electrical connection can shunt any currents away from the coaxial cable, hopefully doing less damage that way.

What am I going to do? My future mobile installations will have only one fuse in the positive lead. I'll also bond the radio body to the vehicle chassis, with a hefty, low-resistance connection.

My existing mobile installations all have two fuses. I won't be changing them out because the risk of inducing a problem with the negative lead fuse is rather low. I don't see the negative lead fuse as a big risk. If you choose to follow the amateur radio manufacturer's two fuse recommendation, I understand.

A Request

The amateur radio equipment manufacturers need to give this issue a fresh look. At a minimum, the presence of ELD's needs to be addressed and the common recommendation of wiring directly to the battery is obsolete. But the one-fuse-or-two issue should also get a careful look by the manufacturer's engineering teams.

That's my analysis. What do you think?

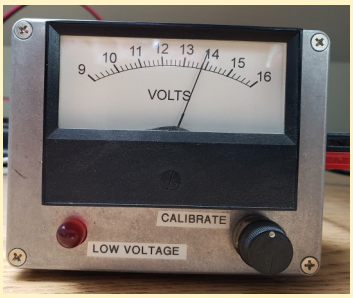
(Runs and ducks for cover.)

~ Bob K0NR

Note: This article is my technical opinion but my attorney says to tell you that you are responsible if you destroy your vehicle while wiring up your transceiver.

John VA7XB has some additional power and fusing tips:

I am in the habit of monitoring my station power supply, which relies on a sealed battery kept at full charge by a Samlex 1230UL charger. This homemade monitor displays the voltage applied to my HF transceiver, nominally 13-14 v. If the voltage drops below about 12 v while transmitting, a red low voltage LED comes on while I am transmitting and alerts me that something is amiss.



This has happened on two occasions and the fault has proved to be an excessive voltage drop across automotive-type blade fuses within my 12 v power distribution panel.

I have kept the failed fuses around just as a reminder that blade fuses appear to be prone to this type of problem. In the image can be seen where the top-most terminal of each fuse has overheated and melted the plastic. Be wary of blade fuses! The fuses are 40 Amp and 25 Amp respectively.

If your rig fails to deliver the stated power or shuts down due to low voltage supply, the problem may just be the fuse.

~ John VA7XB

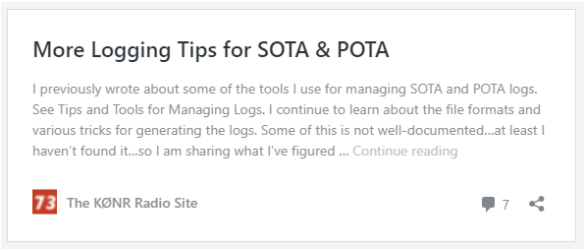
...more

Combined Logging for SOTA and POTA

Doing a simultaneous activation of a Summits On The Air (SOTA) summit and a Parks On The Air (POTA) park is becoming more common. There is a lot of crossover between the two programs. Here in Colorado, many of the SOTA peaks are in national forests or national parks, making them an ideal double activation.

Creating one file for logging both programs can be a challenge but I've settled in on an approach that works for me. I've decided to use HAMRS for this, whether it is real-time logging or transcribing a paper log after the event. HAMRS provides useful templates for both SOTA and POTA, but not both simultaneously. HAMRS still has a few quirks on entering callsigns and timestamps, but I am hopeful those things will get addressed in the fullness of time. If you are using a different logging program, you can probably still benefit from this post.

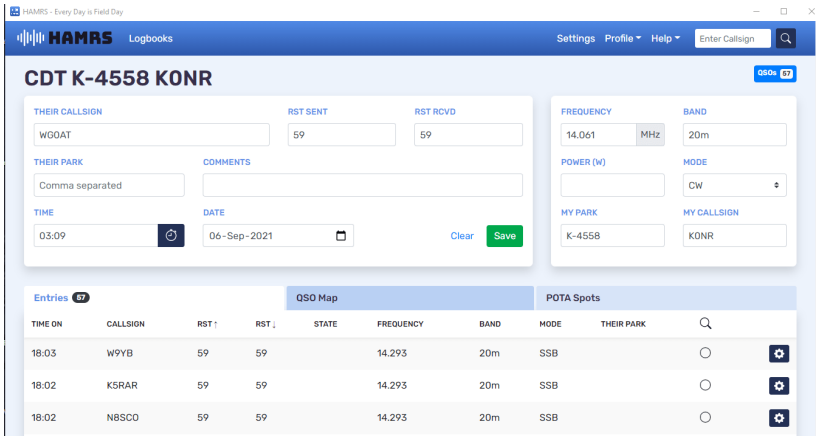
I wrote about the different ADIF fields that POTA and SOTA use here:



Simplest Case: No P2P or S2S

For an activation that does not involve making contact with other parks or summits, the logging requirements are simple. POTA refers to these contacts as Park-to-Park or P2P, while SOTA refers to them as Summit-to-Summit or S2S. Same basic idea.

The ADIF file for POTA needs to have the usual logging information but the special POTA fields (MY_SIG_INFO, SIG_INFO) can be left blank. The filename will indicate the park you are operating from and must meet the standard POTA format. (Example: K0NR-K-4404-20211017.adi for K0NR operating from K-4404 on 17 Oct 2021). If you do have some simple P2P QSOs in there (one park contacting another single park, no double activations), the POTA database will attempt to identify these contacts by



comparing the logs of the two POTA activators. I believe this works pretty well but I have not tested it extensively.

For the SOTA log, you must provide your SOTA summit using the MY_SOTA_REF field. If you use the HAMRS SOTA template, it will take care of this for you. Then you can use the same ADIF file for POTA by setting the filename to the right format. If you need to add the MY_SOTA_REF manually, ADIF Master is a good tool to use.

With P2P or S2S

When there are P2P or S2S contacts, things get a bit more complicated. The ADIF log needs to have MY_SIG_INFO for each QSO set to your POTA number and SIG_INFO set to the other station's POTA number. If the other POTA station is activating more than one park, this can be handled by entering multiple QSOs in the file. (I think this is the cleanest way of handling it, but let me know if you have other methods.)

The SOTA logfile requires something similar, with MY_SOTA_REF set to your SOTA summit and SOTA_REF set to the other station's SOTA summit.

One ADIF can be created that has all four SOTA/POTA fields set correctly but you'll probably have to use ADIF Master or a text editor to get this all entered.

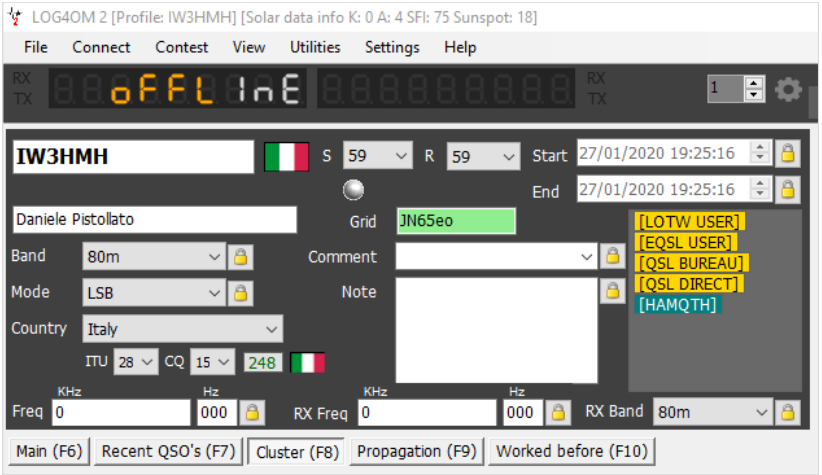
HAMRS can help you with either SOTA or POTA, using the corresponding template. Normally, I try to determine if I have more P2P or S2S contacts and choose the template (POTA or SOTA) with that in mind. Then, I use ADIF Master to add in the other -OTA program logging info.

POTA does allow for simultaneous activations of more than one park. For example, the Continental Divide Trail is considered a park and it often runs through a national forest, so both can be activated together.) If you are activating more than one POTA park, you will need to create a log file for each park and submit them individually. A SOTA activation can only be from a single summit.

Wrap Up

I treat my SOTA/POTA logs as separate files but I also import them into my master logging program, which is currently Log4OM2. I also upload the file to Logbook of The World (LoTW). It is important to set up a new LoTW location with the grid locator, state and county set correctly. This may create a long list of locations in your LoTW account but provides proper confirmation for stations chasing grids, states, and counties.

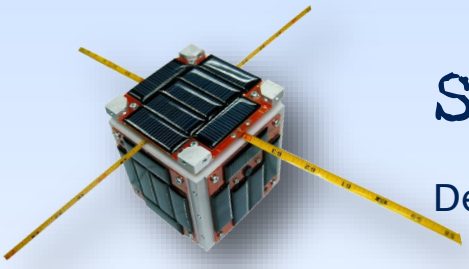
These are some things I've learned along the way and I hope you find them useful.



~ 73 Bob K0NR

Update 14 Apr 2022: Mike/KD5KC pointed out that AC-LOG from N3FJP can be configured to handle the SOTA and POTA fields simultaneously.

Log4OM2 is a free Windows software logging program available at: https://www.log4om.com/welcome/



Satellite News

Deep space:

Scientists hope to broadcast DNA and Earth's location for curious aliens

"Even if the aliens are short, dour and sexually obsessed," the late cosmologist Carl Sagan once mused, "if they're here, I want to know about them."

Driven by the same mindset, a NASA-led team of international scientists has developed a new message that it proposes to beam across the galaxy in the hope of making first contact with intelligent extraterrestrials.

The interstellar missive, known as the Beacon in the Galaxy, opens with simple principles for communication, some basic concepts in maths and physics, the constituents of DNA, and closes with information about humans, the Earth, and a return address should any distant recipients be minded to reply.

The group of researchers, headed by Dr Jonathan Jiang at NASA's Jet Propulsion Laboratory in California, says that with technical upgrades the binary message could be broadcast into the heart of the Milky Way by the Seti Institute's Allen Telescope Array in California and the 500-metre Aperture Spherical Radio Telescope in China

In a preliminary paper, which has not been peer reviewed, the scientists recommend sending the message to a dense ring of stars near the centre of the Milky Way – a region deemed most promising for life to have emerged. "Humanity has, we contend, a compelling story to share and the desire to know of others – and now has the means to do so," the scientists write.

The message, if it ever leaves Earth, would not be the first. The Beacon in the Galaxy is loosely based on the Arecibo message sent in 1974 from an observatory of the same name in Puerto Rico. That targeted a cluster of stars about 25,000 light years away, so it will not arrive any time soon. Since then, a host of messages have been beamed into the heavens including an advert for Doritos and an invitation, written in Klingon, to a Klingon Opera in The Hague.

Such attempts at interstellar communication are not straightforward. The odds of an intelligent civilisation intercepting a message may be extremely low, and even if contact were made, establishing a fruitful conversation could prove frustrating when a response can take tens of thousands of years. Aliens may not even understand the signal: as a test run for the Arecibo message, Frank Drake, its designer, posted the missive to some scientific colleagues, including a number of Nobel laureates. None of them understood it.

There are other concerns, too. More than a decade ago, Prof Stephen Hawking warned that humans should refrain from sending messages into space in case they attract the wrong sort of attention. "If aliens visit us, the outcome would be much as when Columbus landed in America, which didn't turn out well for the Native Americans," he told a Discovery channel documentary.

Read the full story at:
https://www.theguardian.com/science/2022/apr/18/scientists-hope-to-broadcast-dna-and-earths-location-for-curious-aliens?CMP=Share_AndroidApp_Other

~ Steve G4HPE

Ham Hardware

Reg Natarajan VA7ZEB

Handy-Talkies compared

Set your .PDF reader view mode to 'adjacent page' to view the entire chart

	Baofeng UV5R	Baofeng UVS9	Jianpai 8800	Yaesu FT4XR	Icom V86	Alinco DJ-MD5
						
Price $CAD	$35	$50	$105	$119	$186	$230
						Important
DC Jack for Field Charging	No	Yes (USB w/opt cable)	Yes (USB-C)	No	No	No
FM Broadcast Rx	Yes	Yes	Yes	Yes	No	Yes
Dual Band	Yes	Yes	Yes	Yes	No	Yes
Simultaneous Dual Receive	No	Yes (instant switch)	Yes (tbc)	No (5 sec polling)	No	Yes (instant switch)
Marine/LADD/FRS/GMRS Rx	Yes	Yes	Yes	Yes	Yes	Yes
Long Alpha Tags	No	No	Yes (12 chars)	No	No	Yes
Memory Banks	No	No	Yes (tbc)	Yes	No	Yes
Waterproof	No	No	Yes	No (FT65 has IP54)	Yes (IP67 Milspec)	No
High Quality Feel (opinion)	No	No	Yes	No	Yes	Yes
Standard Prog. Interface	No	No	Yes (Bluetooth!)	No	No	Yes (USB micro)
						Nice to Have
Superheterodyne	No	No	No (tbc)	No	Yes	No
APRS	No	No	No	No	No	Yes
AM Broadcast Rx	No	No	No	No	No	No
AirBand Rx	No	No	Yes	No	No	No
Shortwave Rx	No	No	No	No	No	No
CB Rx	No	No	No	No	No	No
Digital Voice Modes	No	No	No	No	No	Yes (DMR)
220 band Tx	No	Yes	Yes	No	No	No
Private Encryption	No	No	Yes	No	No	Yes
						Opinion
Reg's Notes	*Everyone's first radio. Far better than it has any right to be for $35. Spurious emissions are not an issue with recent models. Programs easily with Chirp. Still, the UVS9 is a much better radio for $15 more.*	*A significant upgrade to the UV-5R. Simultaneous receive really works. USB charging is a game changer. 220 is fun to play with. Better display. I bought one and really haven't had any complaints.*	*This is the most impressive radio I have ever seen out of China. It ticks all the boxes I care deeply about. USB C on the battery is how everyone should do it. Signal and reception reports are among the best I've heard.*	*I bought one. I hate it. Dual-watch checks every 5 sec, which even Baofeng beats. No field charging. Bad signal reports. Useless programmable keys. Audio drops in and out. Upgrade to a Baofeng instead.*	*This radio doesn't tick many of my boxes but it's built like a brick and is honest about what it does. 7 watts matters. Icom quality is a real thing, too. I won't buy one but I respect it.*	*This is a really impressive radio that is let down by the lack of field charging, which is a deal-breaker for me on a handheld. Still, if I wanted to get into DMR, this would be my path.*

Please note, the fields on the left are listed in my personal order of importance, and the distinction between "important" and "nice-to-have" also reflects my personal priorities.

Reg VA7ZEB has spent considerable time researching for his new handheld transceiver. While doing so he recorded his observations on a spreadsheet, which he is sharing with the amateur radio community.

Prices are listed in Canadian dollars at the time the chart was compiled.

If you would like to look at the original, head to Reg's download link: [VA7ZEB Reg's HT Comparison Table 2022 - Google Drive]

~ Reg VA7ZEB

	Yaesu FT-70DR	Yaesu FT-60	Yaesu VX6R	Anytone 878UV2+	Yaesu FT5D	Icom ID-52
						
Price $CAD	$240	$250	$320	$380	$510	$750
DC Jack for Field Charging	Yes (USB w/opt cable)	Yes (USB w/opt cable)	Yes (USB w/opt cable)	No	Yes (USB w/opt cable)	Yes (USB-Micro)
FM Broadcast Rx	No	No	Yes	Yes	Yes	Yes
Dual Band	Yes	Yes	Yes	Yes	Yes	Yes
Simultaneous Dual Receive	No	No	No	Yes	Yes	Yes
Marine/LADD/FRS/GMRS Rx	Yes	Yes	Yes	Yes	Yes	Yes
Long Alpha Tags	No	No	No	Yes	Yes	Yes
Memory Banks	Yes	Yes (10)	Yes	Yes (Scan Lists)	Yes	Yes
Waterproof	Yes (IP54)	No	Yes (JIS7)	Yes (IP54)	Yes (IPX7)	Yes (IPX7)
High Quality Feel (opinion)	Yes	Yes	Yes	Yes	Yes	Yes
Standard Prog. Interface	No	No	No	No	Yes (SD Card)	Yes (USB micro)
Superheterodyne	Yes	Yes	Yes	No	Yes	Yes
APRS	No	No	No	Yes	Yes	No (has DPRS)
AM Broadcast Rx	No	No	Yes	No	Yes	No
AirBand Rx	Yes	Yes	Yes	No	Yes	Yes
Shortwave Rx	No	No	Yes	No	Yes	No
CB Rx	No	No	Yes	No	Yes	No
Digital Voice Modes	Yes (C4FM)	No	No	Yes (DMR)	Yes (C4FM)	Yes (DSTAR)
220 band Tx	No	No	Yes	No	No	No
Private Encryption	No	No	No	Yes	No	No
Reg's Notes	*A high-quality superhet HT that can be field-charged. I cannot fathom why Yaesu didn't give it FM Broadcast Rx which is an EmPrep deal-breaker for me. If it hits the fan, I want to hear what the CBC has to say.*	*A straightforward, high quality, old-school, superhet radio that appeals to a lot of people. I'm just not one of them. For $10 less, the FT-70DR is a better radio. For $70 more, the VX6R is a much better radio.*	*I know several people who own these but I never really understood them until I compiled this list. Now I get it totally. I won't buy one as I care about dual receive and alpha tags at this price, but I respect this radio a lot.*	*A high-quality DMR radio with many excellent features, but its price compared to the Alinco DMR alternative is simply too high. I'd buy the Alinco if I wanted to get into DMR.*	*The clear winner of this shootout, at least for me. I own the older FT3D and it has been the best HT I've ever owned by far. This radio receives everything, does everything, and is far more rugged than I am.*	*This is an impressive radio, and I love that it has USB charging on the body (even though it's goofy they used micro and not C). But $750? Seriously, Icom? Unless you're into D-Star, get an FT5D.*

I recognize and respect that others will have different priorities. These are mine. ~Reg VA7ZEB

Mike Weir VE9KK

My ham radio adventure continues…

We all have read about backing up your PC in the event your beloved hard drive will just stop spinning out the information you have become accustomed to. I am sure most of us have added a few gray hairs when all our info vanished with the greetings of the blue screen of death (in the case of Windows) At that point in time the little voice in our subconscious whispers "just resort to the backup… oh that's right there is NONE!!

Well, I am here to say that I did not have a hard drive failure and if I did I have a dedicated drive with clone backups of my main hard drive and another separate drive with image backups. These backups are done on a regular basis and in fact, I have had to go down the restore road twice now and it has worked amazingly.

My click of the mouse was during my just being bored and "clicking" around my logging program N3FJP logger. I still am not sure what I did but somehow I deleted my whole log...yup 16,000 contacts GONE! Well, not a big deal I thought as I also upload my contacts to LOTW, Club log, QRZ.COM and Eqsl. Soooo Eqsl I just could not figure out how you can even export contacts so that option was out. QRZ.COM you can export your log but first, you have to be a paid member and I am not. The free version only allows you to upload and I have no issue with that at all. I was then off to club log and for the life of me I searched everywhere and I could not find any link to download the complete log… having said that I know there is going to be a comment posted that explains it and I missed it. Well next is LOTW and again I could not find anything there.

Now I did post a question on N3JFP's contest logger IO groups site and Scott (The developer of the software) got back to me right away. Before I go on yes Scott is the developer but not just him it's his wife Kimberly and his son Chris who work as a team it just happened to be Scott that got back to me. He gave me a suggestion that also got me to think. Long story short I did find out that within the N3FJP logger program you can request LOTW to download a complete copy into N3FJP. Excellent my issue has been resolved… not so fast!

It did download a complete copy of the log BUT the number in which the contacts were entered was reversed.....so my first contact was numbered 16001 and my most recent was 1 ARE YOU KIDDING ME!!.

It was time for tea and some relaxation as really in the big picture it's a hobby and not the code for a missile launch. The next day I was reading the email again that Scott had sent me and at the bottom of the email there was a link. It was a bot in which you entered your question and the bot did the search. Low and behold the bot gave me info on how N3FJP automatically stored a backup of the log. I found the backup and was thrilled. So I deleted the complete log again (on purpose this time) and restored my log using this back up and I was back in biz!!

The lesson of the day is yes you may have a backup for your PC and I do BUT being a ham a log backup is also very important just in case like me you end up clicking your mouse one too many times and well… you read the possible results.

~ Mike VE9KK

My antenna restrictions

No success indoors with the loop

I have now retired and we sold our condo in the Toronto concrete jungle and moved to New Brunswick on the East coast. We are on the outskirts of Moncton and I am finally able to have an outdoor antenna! The property we have is not huge so I purchased an Endfed antenna from Ulitmax antennas. Having an outdoor antenna is great considering the antennas listed below were very much a compromise. Living on the East coast has brought me great DX into Europe something I never had in Ontario.

Below is my former QTH's but I chose to keep it on the blog as many other hams have similar limitations and I hope the info below can help

We moved to the big city… Toronto… and to a condo apt! The challenge has increased I no longer have the use of an attic here it's a concrete and reinforcing bar all around me. I tried some indoor antenna operating using my Alexloop but it was a no-win situation. No matter where the loop was situated I was just not getting out. I then put the loop on the balcony in the vertical position and for some reason that netted me zero contacts as well. I then tried the loop in the horizontal position and for the first time, I was spotted on the Reverse Beacon network. This told me that the balcony is going to do the trick I did not want to use the Alexloop as it required me to go out and manually adjust the loop for band and minor frequency changes. In the winter months that was not ideal. So the hunt started for the balcony antenna, it had to be stealth (as condo rules do not favour antennas), multi-band with adjustments from indoors and able to handle cold winters without troubles. The choice ended up being the MFJ 1788 loop antenna this antenna covers 15 to 40m. At this point, the antenna is on order so it's the Alexloop.

Living in a condo has its challenges and opportunities for ham radio. I have often read about fellow hams living in restrictive antenna neighbourhoods, it seems to be more commonplace now than in the past. In the past, it only affected amateurs who either lived in apartments or those who were in townhouses. Now we are all to familiar with new housing developments and how antennas of any type are prohibited. Now and then you read about legal action taken against radio amateurs regarding antennas and or towers. In which legal costs can skyrocket in a very short time. There are no guarantees in the end that your tower and or antenna will be allowed to stay up. Here is a pick of my state-of-the-art cutting-edge world class antenna farm.

40-meter mobile whip dipole

The 20-meter dipole in the attic I run 5 watts into this antenna and have had great success with it. I also have made dipoles out of mobile whip antennas this allows me to get the lower bands into an attic installation. At the moment I am planning to install an Alpha Delta DX-EE. This will allow me to

20 Meter dipole

Weaving around the attic

remove the dipoles allowing me some room for VHF/UHF antennas as well as 6m.

WELL THE ALPHA DELTA DX-EE IS UP AND RUNNING !!

~ Mike VE9KK

Mike writes from New Brunswick, Canada.
Contact him at ve9kk@hotmail.com.
VE9KK Blog (ve3wdm.blogspot.com)

Using electric fence standoff's

Ready to go

Ham Hardware

John Schouten VE7TI

An easy 'no solder' CW code practice oscillator

We are about to start our first CW (Morse code) course since the start of the pandemic. One of the frequently asked questions is: "Do you provide a code practice oscillator?" Well, we do, but we only have a half-dozen or so MFJ-557 oscillators *[shown below right]* (US$ 75) in our inventory. Various others are widely available on the Internet at various prices, the MFJ being on the high end.

One common complaint from our CW Elmers is that the MFJ and other oscillators produce a raspy tone. This is because many do not use a pure sine wave circuit. A square wave has many harmonics and it is not a pleasant tone to listen to. The signal generator suggested below does produce a very pure tone and the frequency is fully adjustable throughout the range of human hearing (and beyond).

The amplifier module has a volume control and has plenty of wattage to drive a small speaker or your headphones. It is stereo, although mono is sufficient for this use. I have found this to be an incredibly capable little device and well worth the few dollars it costs. I have used them in many small projects.

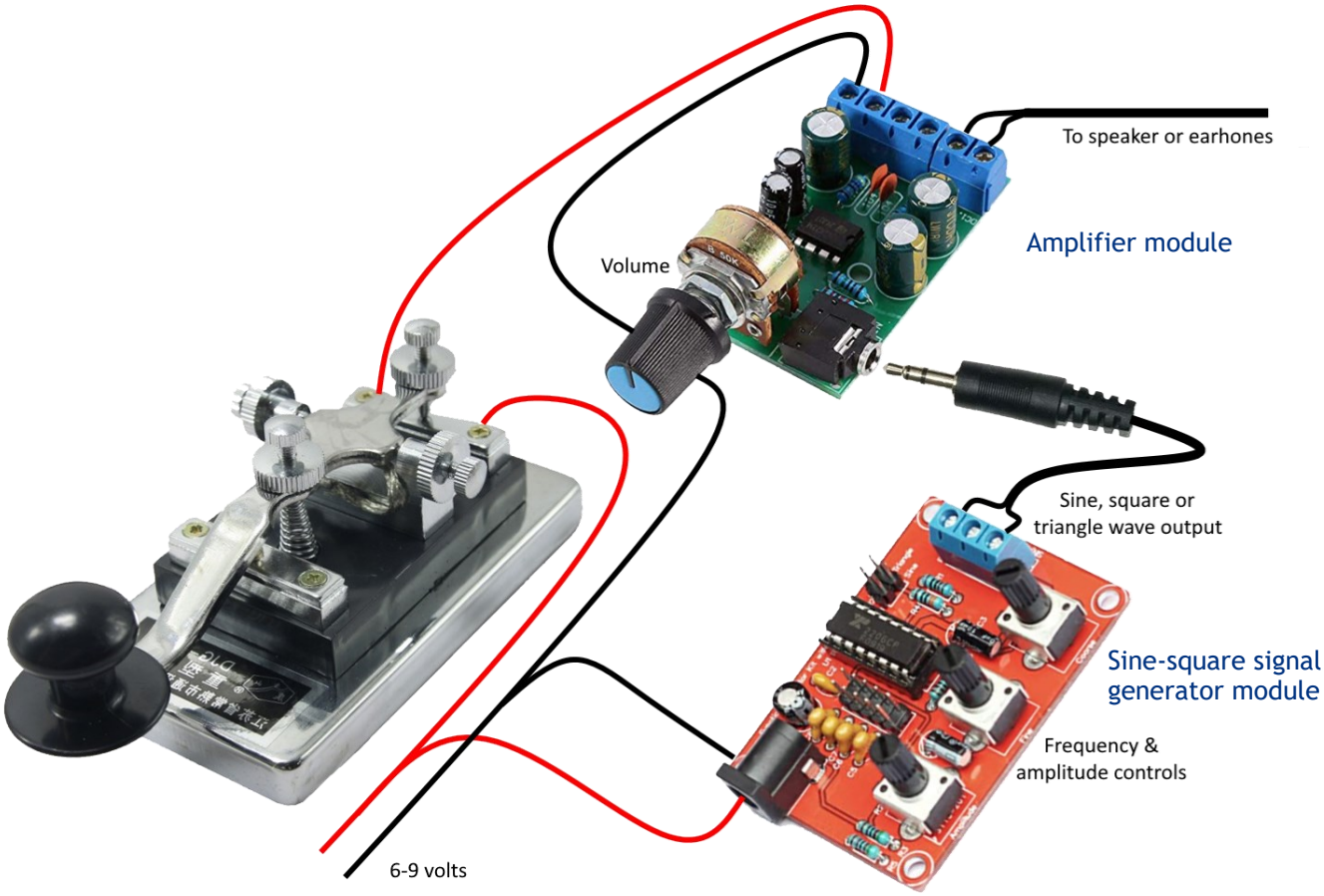
In past issues of The Communicator we have offered you various circuits that range in complexity and features but, I am told many find that an insurmountable obstacle. So I have built and tested something that will more than serve the purpose and is a project that I believe even my 8-year old granddaughter could build.

All the parts are readily available from Amazon and the price is affordable.

The parts list:

- Signal Generator XR2206 *[shown below left]* High Precision Function Signal Generator, Sine/Triangle/Square Output 1Hz-1MHz Adjustable Frequency Amplitude (C$14 Amazon.ca).
- 2Pcs YX1511 Audio Power Amplifier Board *[shown right]* Dual Channel TDA2822 2.0 Stereo Audio DC2V-12V 1.5W 4-32Ω (C$14 Amazon.ca)
- PET13-1020 3 Feet 3.5mm to 3.5mm Dubbing Audio Cable (C$0.43 Amazon.ca).
- A 6 to 9 volt DC wal-wart. You likely already have one around the house that you can use, but Amazon.ca has one for $C13), or use a 9-volt battery.
- Eisco Labs Contact Key, Telegraphing/ Morse Code (C$ 7.85 Amazon.ca). This was the least expensive one I could find but there are lots you can make very easily following plans on the Internet; after all, its just a springy piece of metal and two contacts.

I have quoted Canadian prices, US prices are considerably less expensive as is eBay, however with eBay you may have to wait a few

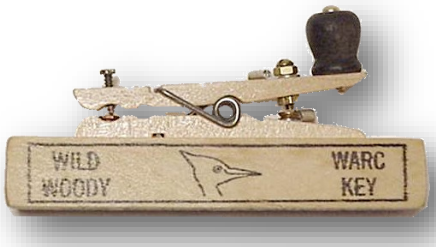


weeks for delivery. If you have access to Mouser or a local electronics parts store you may do better as well.

I thought that I might run an experiment. I laid out the components as above for my granddaughter and asked her if she could figure out how to connect them together. She had successfully soldered some LED Christmas tree kits last year (*The Communicator Jan-Feb 2022*) so I thought that this would be an interesting challenge for her. She and her younger sister love to play with my MFJ oscillator so making this herself should provide the incentive.

It took her about 10 minutes but she was able to figure it out and she was soon keying her name, that of her sister and a few friends names that she tested my CW memory with.

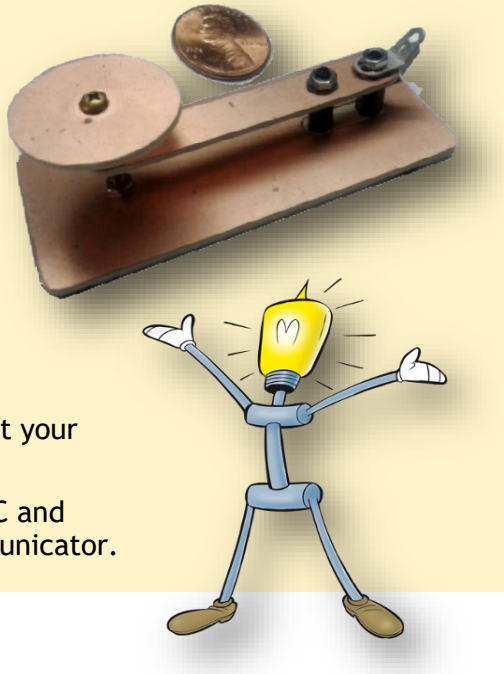
~ *John VE7TI*



Now, show us yours…

'Build a Key' contest

OK, so Luc showed us how you can make a key in the March-April 2022 issue of The Communicator. Be it 'straight' or a 'sideswiper', its your turn… Metal? Wood? 3D-printed? SARC is sponsoring a contest for home-built keys. We will award a prize to the following categories:



The most useful key

This key must be compact, accurate, comfortable to use and reasonably sturdy.

The most beautiful key

Goes without saying… this one must be a thing of beauty but must also conform to the above criteria of being accurate, comfortable to use and reasonably sturdy.

The most unique key

Aside from being accurate, comfortable to use and reasonably sturdy, let your imagination rum wild.

Because we have to judge these locally, the contest is only open to SARC and SEPAR members. Results will be published in the Fall issue of The Communicator.

I have written in The Communicator before about the free magazine service our local Vancouver area library system offers to card holders. A recent addition to the hundreds of magazines offered is Practical Wireless. I had not known of this publication earlier but have found it an interesting addition to my reading and recommend it to you.

By way of history, Practical Wireless is a British radio and electronics magazine, The magazine was founded in 1932 (as a supplement to "Hobbies") by FJ Camm, of George Newnes Publishers. It became an independent weekly in September of that year, then became a monthly in 1940, due to wartime paper shortages. Camm was editor until his death in 1959. Practical Television was a supplement to the magazine for a short while before the war and became a separate publication in 1950. In January of 1935, Practical Wireless absorbed "Amateur Wireless" magazine by means of a merger.

~

In The Shack

Tom Wagner N1MM

Top features in N1MM logger that you should be using, but probably aren't

VE7SAR we do a lot of contesting and we use N1MM+ exclusively for our logging. At my home station I use N1MM+ as well, both for contesting and as my general logging software. This article provides some very useful tips from the N1MM+ creative team.

Tips:

- Print this list double-sided and highlight those features you want to try this contest season.
- Print the key assignment in the link below for reference use during the contest:

At http://n1mm.hamdocs.com/tiki-index.php?page=Key+Assignments+Short+List&structure=N1MM+Logger+Documentation

1. CW - Enter sends messages. Users of this feature love it. Non-users just don't get it. What ESM does - particularly on CW - is to reduce stress. Instead of having to remember what button to press to send what message, you almost always send <enter>. Trust me, you will be very surprised had how much this reduces the stress during a contest, especially when you are tired. See tip #2 for how to send a repeat while using ESM.

Use Ctrl+M to toggle 'Enter Sends Message' mode. The function key "convention" used by N1MM logger and most otherlogging programs is:

ESM mode: S&P - CW or SSB	ESM mode: Run - CW or SSB
1. <enter> sends F4, your call	1. <enter> sends F1, "CQ"
2. <enter> sends F2, your exchange and logs the QSO	2. type call, <enter> sends F5(his call)+F2(exchange)
NOTE - for SSB, put a single blank space in the F5 message - speak the callsign instead - because of the blank, N1MM will skip F5 and send the F2 message	
3. type his exchange, <enter> sends F3 (QSL/QRZ/TU) and logs QSO	3. type his exchange, <enter> sends F3 (QSL/QRZ/TU) and logs QSO

F1=CQ

F2=exchange

F3=TU/QSL/QRZ

F4=your call

F5=his call

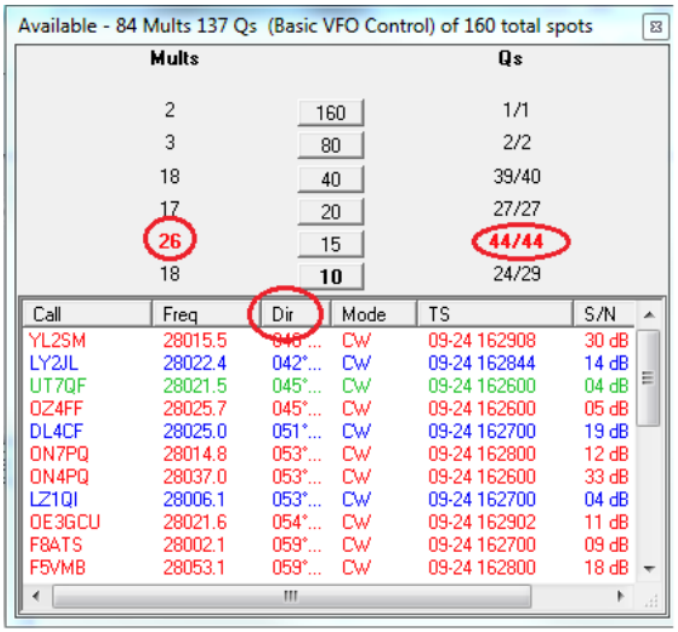
2. = (equal key) to resend a message - Will send the last message key (F1-F12) again. If the last message sent was the exchange, it will send that. If it was you dumping your call in a pileup, it will send your call. Easy!

3. Alt+Q to find last CQ frequency- Jumps to the last CQ frequency on this band (active bandmap) and will clear alltextboxes in the Entry Window. You can use this when you tune around trying to get a few S&P QSOs during a slow run. Jump to a spot, work it, and press Alt-Q to get back to your CQ frequency and resume running. See also Tip #16 below.

4. Available window: sort stations by beam heading. To sort the stations by beam heading, click on the column heading for beam heading. (You can click on any of the columns to toggle ascending/ descending sort on that column.) This tip is useful in the afternoon when you are no longer running, but there are spots for stations coming in at all different beam headings. Sort them, and work them in beam heading order to speed up the process of clearing a band of unworked spots. *[see picture top right]*

5. Available window spot/mult counts. The numbers to the left of the band buttons show the number of unique, unworked mults on that band. The numbers to the right of the band buttons show the number of unworked and total stations available on that band. Use these numbers to help you judge what bands are open, when to change bands, and which band to change to. *[see picture lower right]*

6. Ctl-up/down, Alt-Ctl-up/down to jump from spot to spot. These keystrokes will jump to the next spot or mult on this band. This is especially useful while trying to S&P in between running stations. Use Ctl-up/down to find a spot to work, work him and use Alt-Q to resume running.



7. Check partial - Guess! If you can touch-type, you should watch the check partial window for calls. Especially on SSB, you may be able to guess the station's callsign as you are speaking it. If you guess correctly, you have just shaved a few seconds off the QSO. If the rate is good, this will make a big difference.

8. Alt-D to delete a spot. It's annoying to come across the same wrong spot over & over. Use Alt-D to delete it. If you keep seeing the same wrong spot, or bad spots from the same spotter, use the blacklist functions (right click on the spot on the bandmap to access) to ban the spot or spotter.

Note: Q: What do you call a spotted call frequency with nobody there?

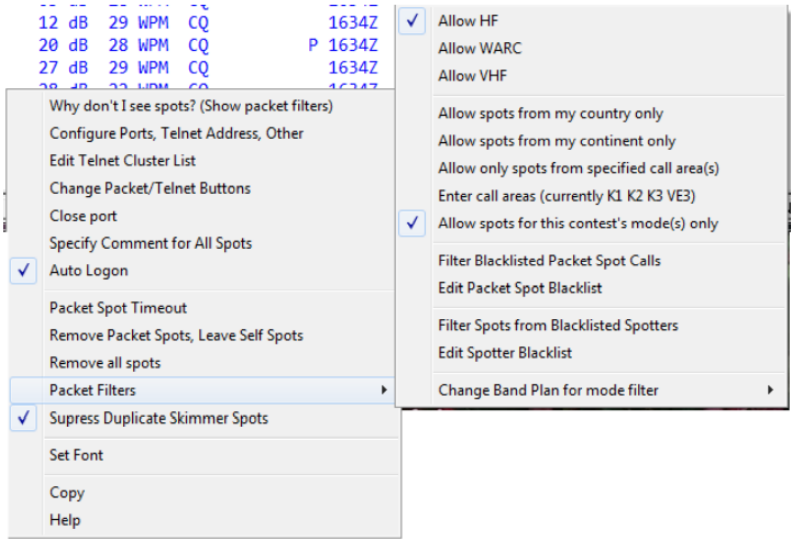
A: Your new run frequency!

9. Ctl-Enter to set a split. You hear 9A1A calling CQ on 7050 "listening 214.5". Type 214.5 and press ctl-enter to split to 7214.5.

Another split tip: did you know you can set up an ssb message that will speak the split frequency? Use @ to voice the current receive frequency if you have recorded files for individual letters and numbers. The frequency will be voiced to the nearest 100 Hz, dropping .0 if receiving on an even KHz frequency. This capability can be used to avoid having to rerecord CQ messages on 40m split. Here is an example:

C:\Program Files\N1MM logger\wav\ {operator} \CQ Listening.wav@C:\Program Files\N1MM logger\wav\{operator}\AndThisFreq.wav

With appropriate recorded wav files it will voice messages like: November 1 Mike Mike listening 7054 and this frequency.



10. Packet Filters - Right click on the packet window to access the packet filters. Many options here -- you might want to see spots from the whole world at times, and at others you might only want to see spots from K1, K2 & K3. Caution - use the "Why don't I see spots?" option to diagnose problems. *[graphic below left]*

11. Up/down arrow to tune the radio.

- Up Arrow - Tune radio down (down in freq, but UP the bandmap) 100 Hz on SSB, 20 Hz on CW (adjustable in the configurer). K3, Flex, Orion, FT-1000MP, FT-890, FT-920, FT-990 and FT-1000 and all Kenwood radios
  - In S&P - pressing the up/down arrows will turn off RIT and tune your main VFO.
  - In Running mode - it will turn on your RIT and tune the RIT.
- Down Arrow - Tune radio up 100 Hz on SSB, 20 Hz on CW (adjustable). See Up Arrow information above

12. Alt+F9 toggle antennas - toggle through all the antennas for that band. The selected antenna will show in the status pane. Multiple antennas for each band can be set up in the Configurer Antenna tab. Antennas can be rotated from all networked computers if desired.

13. Ctrl+Q edit a spot - Quick Edit mode, go back one qso in the log. Enter logs and Escape discards the changes made. Press multiple times to go back multiple Qs. This is the preferred way to make quick edits during a contest.

14. Alt+' (Alt+singlequote) to set filter width - toggle between the wide and narrow radio filter for the selected mode (SSB, CW and Digi modes).

15. Muli-User Partner Mode - see calls the other station is copying as he types them.

- To indicate which station you want to partner with, right click on it's "cue-ball" in the info window, and select the option "Target for call stacking"
- Tune your radio to the exact frequency of the target station's radio.
- As you type, your partner will see the call you are typing on their Entry Window's callframe. If they have set up partner mode from their side, you will see their typing in your callframe.
- Whoever has control of transmit can choose to work the station in his callsign textbox or they can work the station in the callframe by wiping, then pressing <enter> (ESM) to call the station that is in the callframe.

If you are not on the same frequency, just copy calls and tune off - the calls will be automatically placed in all networked users bandmaps as local spots.

16. CTRL+Shift+Up/Dn to work spots while running - Useful for single op, 2 VFOs (SO2V). Moves VFOB/Sub VFO to the next bandmap spot, skipping over the CQ frequency. Then use Pause to switch when the time is right to work the station.

Software Website:
http://www.n1mm.com/

User Group Website:
http://groups.yahoo.com/group/n1mmlogger/

~ *Tom N1MM*

N1MM Setup -- General Logging

Even if you don't use N1MM for contests, it is still one of the best (and *free*) programs for general logging. Here are the steps to get started setting up logging and creating an .ADI log file for submission to programs such as Logbook of the World (LoTW).

1. In N1MM go to: File | New Log in Database. Use DXpedition as the Log Type. This will allow you to log callsigns, which is all you need. Click OK.

Then go to: Config | Change Your Station Data. Enter the following:

- Call: Your callsign, ours is VE7SAR
- Grid Square: your grid square, ours is CN89ot
- CQ Zone: 3 in our case
- ITU Zone: 2 in our case

You can find the above three values at: Ham Radio Maps

This will put all the correct information in the log and thus in the ADIF file when it is created. If your rig is not computer controlled please make sure N1MM is configured to the band and mode you are operating. Set each mode you will be using by typing CW, SSB, RTTY or PSK into the call field.

Set your band by typing the frequency into the call field. If you have your transceiver connected to your computer, N1MM will fill all this information for you when you enter a contact.

2. You can export your log file to another logging program, such as on-line at QRZ.com, as a .ADI (ADIF) file named with your call (the call of the station used if you're a guest op). For example, *VE7SAR.adi* would be our station log.

If you use it, submit your log by following the ARRL LoTW log submission process.

~

Ham on the Computer

Mauro Huculak

How to check battery health on Windows 11

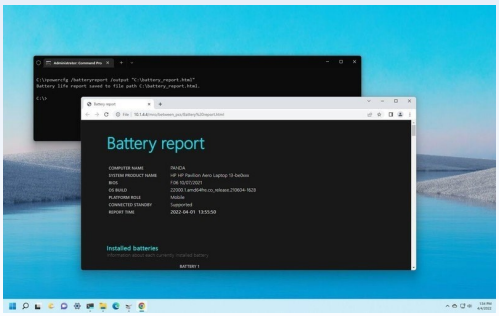
On laptops and tablets, battery life is essential since it'll determine how long you would be running Windows 11 along with your applications. As a result, understanding the health of the battery can be helpful to find out any energy problems or whether the battery needs replacement.

Whatever the reason might be, Windows 11 includes a command-line tool that analyzes the usage over time to generate a battery health report to review the battery specifications, energy usage, estimated battery life, and details to determine whether the device needs a battery replacement.

In this Windows 11 guide, we will walk you through the steps to create and understand the battery health report of your laptop or tablet.

To create a report of the battery health on Windows 11, use these steps:

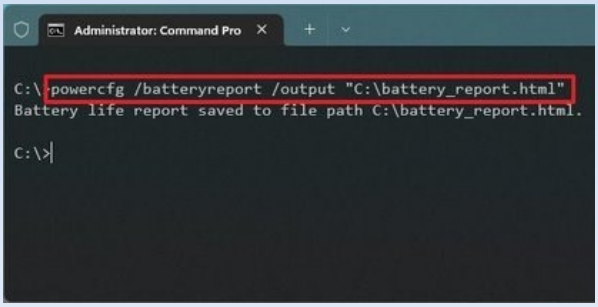
1. Open Start.



2. Search for Command Prompt, right-click the top result, and select the Run as administrator option.
3. Type the following command to create a battery report on Windows 11 and press Enter:

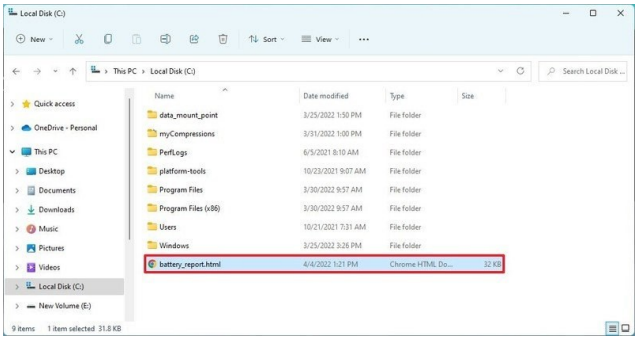
   powercfg /batteryreport /output "C:\battery_report.html"

Once you complete the steps, the report will be saved automatically in the main installation drive.



Reading the battery report

1. Open File Explorer.
2. Click on This PC from the left pane.
3. Under the "Devices and drives" section, double-click the "C" drive.
4. Double-click to open the "battery_report.html" file with the default web browser.



Battery report output

The report is made up of several sections with self-explanatory information. The section with the most information you want is perhaps the "Installed Batteries" section that gives you a general overview of the battery installed on your computer, including name, manufacturer, serial number, chemistry, design capacity, and cycle count.

If you want to know whether the battery needs replacement, you need to look at the "design capacity" and "full charge capacity." In the example, you can see that the battery was designed to hold 44,156mWh, and the full charge capacity is 44,156mWh, indicating that the battery can still hold 100% of the charge. However, if the full charge capacity drops significantly (around less than 50%), it could indicate that it's time to replace the battery.

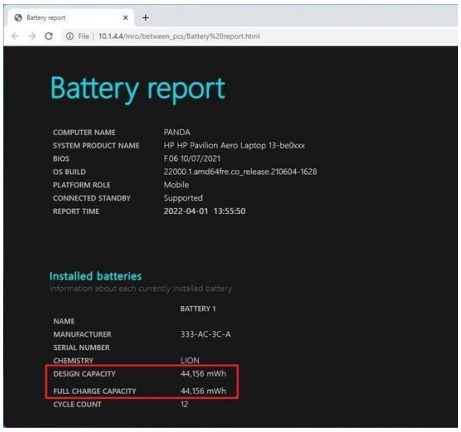
Recent usage details

The "Recent Usage" section shows when the computer was active, suspended, or in connected standby. This information may come in handy to determine whether the device is waking up automatically at random times when it should not.

Battery usage history

The "Battery usage" section shows a graph with valuable information about the battery drain over the last three days.

The "Usage history" tracks how long the computer was using battery power and when it was plugged into an electrical outlet.



Battery capacity history

The "Battery capacity history" tracks the charge capacity history of the battery.

Battery life estimates

Finally, the "Battery life estimates" section shows the battery life based on observed drains. In other words, this section shows a prediction of the battery life for common usage.

The tool works best as it collects more data over time. This means that if you generate a battery report on a new device or new installation, you are not likely to find many useful details. If you encounter problems with the battery, it's recommended to go through several cycles to find patterns that could help determine the problem.

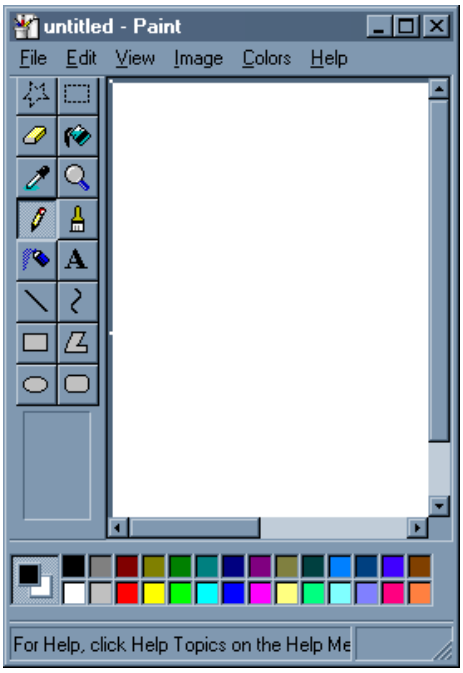
~ Source: Windows Central—How to check battery health on Windows 11

She asked for an iPad

Steve McDonald VE7SL

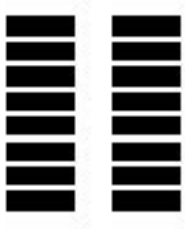
Reproduced with the author's permission, Visit The VE7SL Radio Notebook at: The VE7SL Radio Notebook and Steve's blog at VE7SL - Steve - Amateur Radio Blog

I recently had an inquiry about using 'MS Paint' for drawing PC board layouts. Although there are several freeware programs available for designing and drawing PC layouts, the ones I have tried had onerous learning curves. I also found that unless I was designing boards fairly regularly, I would have to go back and re-learn many of the functions each time I used the program. If you are regularly making a lot of boards, then these programs are certainly the way to go as they are packed with every feature you might need.



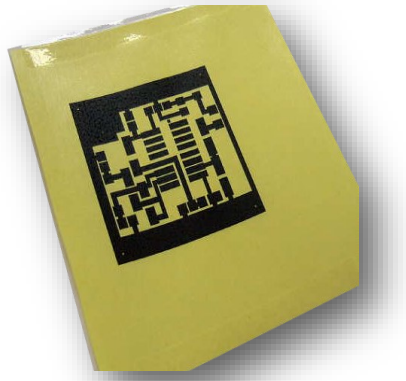
On the other hand, MS Paint meets all of my requirements and is simple to use… I like simple. Although some might turn up their noses at MS Paint, I have found it to be a powerful and underestimated software tool. Here are some of the things that you might want to remember if drawing a PC layout with 'Paint'.

1. Take the time to read the built-in *HELP* and *USING* files. It doesn't take long to learn all of the functions along with some of the shortcuts.
2. Always draw with the *IMAGE… DRAW OPAQUE* function turned off (unchecked). Do this first. This way, lines can go as close as you want without any blocking or overlapping. Try it the other way and you can see what happens.
3. If you are working with IC's, take the time to make a 'master' pattern that can be saved and copied anytime that you need it. A 16-pin layout can by used for 14 and 8 pin IC's by copying and pasting it and then erasing the unwanted pins.



The Communicator

4. Similarly, once you have established the correct pad spacing for certain capacitors or resistor sizes, copy and save them for future use. Finding the correct spacing will require a few trial printouts so you can measure the exact gap. This works great for SMD components as well.
5. For detailed work, use the *VIEW… ZOOM… CUSTOM* function to magnify the layout. This also allows you to use a grid if you find this helpful.
6. Never *SAVE* your layout while in *ZOOM* mode as you can't go back to the original size when you re-load your plan. I learned this the hard way.
7. For drawing perfectly straight lines, squares or round circles, hold the *SHIFT* key down when drawing the element.
8. For large areas of copper (groundplanes), outline the area then choose the *FILL* symbol to create the area.
9. With a little planning, you can almost always avoid jumpers to make a crossover connection, unless your circuit is very complex.
10. When you make a mistake, just use the *EDIT… UNDO* command. You can go back several steps with this helpful function.
11. I will often draw a thin line between to pads to see if they are on the same level… and then *UNDO* the line once I have checked.
12. Always *SAVE* your layout as a Monochrome Bitmap with the FILE… *SAVE AS* function. Using some of the other modes will create less than solid blacks and some random pixels that can lead to etching problems.
13. If using the 'toner iron-on' method of etching, set your printer options to the highest resolution (mine is 1200 dpi) and then choose the darkest 'print' option. You want as much toner thickness as possible. Note that this method works only with laser / toner printers and not the ink-jet / bubble types.
14. For the iron-on transfer paper, I have had good success with the shiny yellow transfer paper widely available on eBay, usually with free shipping. I get the best results when pre-heating the PCB in the toaster oven before ironing-on the pattern. not too hot to touch however.



If you just build the occasional PC board, you might find using MS Paint worthy of a try. It has been meeting my needs for many many years and once you have done a few, unlike some PC software, it doesn't take long to build a new board without having to learn how to use it all over again.

~ Steve VE7SL

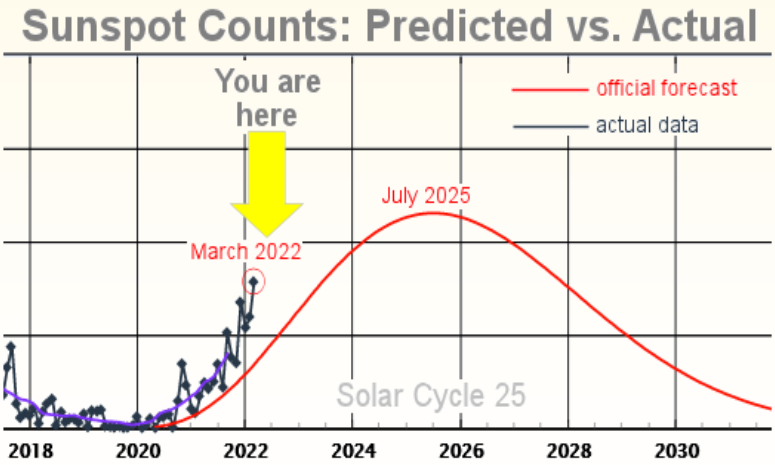
Solar activity developing faster than predicted

The activity of the sun is increasing faster than expected, the sun throws plasma into space.

Munich - All hell is breaking loose on the sun - literally: the visible surface of the sun is seething, solar flares and so-called coronal mass ejections occur.

The sun throws plasma into space. This plasma consists of charged particles that move through space at unimaginable speeds - several million kilometers per hour are possible. When these particles hit the earth's magnetic field, a spectacle worth seeing is created at the poles: polar lights dance in the sky.

But a solar storm also has a negative - even dangerous - side: If a strong solar storm hits the earth at particularly high speed, this can cause problems with the power grid, and radio propagation among other things.



Above: Sunspot counts are ramping up faster than official predictions.

Solar storms occur when the sun becomes more active. The activity of the sun changes in an 11-year rhythm, which can be easily recognized by the number of sunspots. The current sunspot cycle began in 2019, and its maximum is expected between 2024 and 2026. And that could be higher than previously thought.

The Solar Cycle Prediction Panel, operated by the US Oceanic and Atmospheric Administration NOAA and the US space agency NASA, shows that the sun is currently significantly more active than predicted. For example, 29 sunspots were expected for the month of January 2022 - but 54 were actually counted. A similar picture can be seen in February and March 2022. The solar radio flux index - a value that measures the radio emission of the sun - is also well above the expected values.

Communication and navigation systems, power grids, oil pipelines, electronic systems of space probes and the associated structures such as global networking through the Internet or the drinking water supply are particularly affected.

~ *Full article:*
https://newsrnd.com/news/2022-04-13-sun-is-more-active-than-predicted---solar-storms-can-threaten-earth.ByokT-VV9.html

No-Ham Recipes

Barbera Goodier VE3KKY

Italian delight

- 2 cups (500 ml) dry macaroni
- 2 pounds (907 g) minced beef
- 3 onions, chopped
- 1 green pepper, chopped
- 1 cup (250 ml) sharp cheese, shredded (try well-aged cheddar cheese)
- 1 teaspoon (5 ml) chili powder (not powdered chillies! That would be very hot!)
- 1 clove garlic, chopped
- 1 tablespoon (15 ml) brown sugar
- 1 tablespoon (15 ml) Worcestershire sauce
- Salt and pepper, to taste
- 2-14 ounce (420ml) cans tomato sauce
- 1 can mushrooms plus juice
- 1/4 cup (65 ml) butter
- 1/2 cup (125 ml) sherry

This fancier version of macaroni and cheese will be flavourful and filling. Just the thing to eat when watching TV or reading a favourite book. Or maybe while listening to a radio net! Just don't munch while on the air.

Barbara's recipe calls for chili powder. For any new cooks, this means the kind of chili powder you put in chili con carne; it's a blend of fairly mild spices. Don't confuse chili powder with powdered chili, which is made from very hot red peppers. You only have to make that excruciatingly hot-tasting mistake once, and you never make it again unless you are one who loves hotly spiced food!

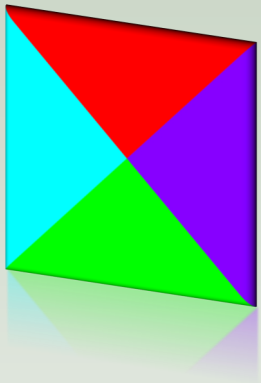
Preheat oven to 350F (180C or a very moderate oven)

Cook macaroni slightly, then drain it and set it aside. For 1 hour, simmer all ingredients (except macaroni and cheese), then pour them into a casserole dish. Add macaroni and cover with cheese. Bake for 1 hour, and then serve.

~ Barbera VE3KKY

Foundations Of Amateur Radio

Onno Benschop
VK6FLAB



How to compare radios

To listen to the podcast, visit the website: http://podcasts.vk6flab.com/ . You can also use your podcast tool of choice and search for my callsign, VK6FLAB.

Full instructions on how to listen are here: https://podcasts.vk6flab.com/about/help

One of the topics I've been talking about lately is the idea that we might be able to measure the performance of your radio in some meaningful way using equipment that can be either obtained by any amateur, or by introducing a process that allows results to be compared, even if they have been generated differently.

Recently I came up with a tool that automatically generates a spectrogram of an audio recording. That on its own isn't particularly interesting, but it's step one in the processing of an audio signal. In addition to the spectrogram, I also created a tool that generates a tone frequency sweep, think of it as a tone that changes frequency over time, let's call it a sweep.

If you combine the two, you can generate a spectrogram of the sweep to give you a starting point or baseline for comparison. You can build on that by using your radio to transmit that sweep and record the result using a receiver. In my initial experiments, I used an RTLSDR dongle to receive the audio with some success and a boatload of spectacular harmonics, but I wanted to find a better, more accessible way to do this and during the week I realised that my Yaesu FT-857d that's sitting in my shack, is connected to a perfectly functional antenna and with a few settings it could do the job perfectly.

One of the biggest issues with my RTLSDR setup was squelch. That is the difference between what is a legitimate transmission and what is noise. Set it too high and you hear nothing, set it too low and you hear everything, including background noise.

Since the VHF or 2m noise levels are quite high at my location, or QTH, I normally have the squelch completely closed. This is fine if you're normally using a strong repeater, but if you're attempting to receive a weak hand-held, that's never going to work.

As any self-respecting amateur I was dragged down the path of last resort to read my user manual where I discovered that in addition to CTCSS, a way to transmit a tone to open a repeater, there's also a setting called Tone Squelch or on my radio TSQ, which will keep my radio squelch closed, unless it hears the CTCSS tone from another radio.

Truth be told, I had to read a different user manual to discover how to actually set the CTCSS tone on my handheld to test, but that's just adding insult to injury. It has been a while since I read any manual, even though I try to get to it once a year or so. I blame it on the lack of field-day camping. That's my story and I'm sticking to it.

So, combining all this, the spectrogram generator, the sweep, CTCSS, and adding a Raspberry Pi with some website magic, if you're interested, an AWS S3 bucket, I now have a service that listens on a local frequency, opens the squelch if it hears the correct CTCSS tone, records the incoming signal until it stops, then generates a spectrogram from that audio and uploads it to a web site.

None of this is particularly complicated, though I did have some bugs to work through. I've published the code as a branch to my existing frequency-response project on github and I've asked my local community to experiment with what I have on-air before I start doing more far reaching experiments.

For example…

If I were to tune my radio to a local repeater output frequency, rather than the simplex one I'm currently on, I'd be able to record and generate spectrograms for each transmission coming from that repeater. If that repeater was connected to the internet, using AllStar, IRLP, Echolink, DMR or Brandmeister, or even all of them, the global community could send their audio to my recorder and it could generate a spectrogram on the spot.

If using that repeater, you played a sweep into your microphone, or used your digital audio interface to play the sound, you could then compare your signal path against others and against the baseline response.

One of the issues with doing this is that much of the audio that travels across the internet is pretty munched, that is, it's compressed, frequencies are cut-off, there's all manner of interesting harmonics and the value of the comparison appears limited at best.

Once I have my multi-band HF antenna, which I'm told is still being built, I intend to set this contraption up on HF where we can do point-to-point recordings and we end up having a direct comparison between two stations who transmit into my frequency-response software.

I should add some disclaimers here too. At the moment I'm only using FM. The intent is to get this to a point where I can compare any mode, but when I move to HF, I'll likely start with Single Side Band and go on from there.

One other annoyance is that any user needs to configure CTCSS to make this work, which is yet another hurdle to overcome, not insurmountable, but I like to keep things simple when you're starting to learn.

Also, the harmonics still show, even on an analogue radio, so there's plenty more to discover.

In the meantime, what kinds of things can you think of to use this for?

~ I'm Onno VK6FLAB

Introduction to the terms of contesting

All podcast transcripts are collated and edited in an annual volume which you can find by searching for my callsign on your local Amazon store, or visit my author page: http://amazon.com/author/owh. Volume 7 is out now.

Feel free to get in touch directly via email: cq@vk6flab.com, follow on twitter: @vk6flab or check the website for more: http://vk6flab.com/

If you'd like to join a weekly net for new and returning amateurs, check out the details at http://ftroop.vk6flab.com/, the net runs every week on Saturday, from 00:00 to 01:00 UTC on Echolink, IRLP, AllStar Link, IRN and 2m/70cm FM via various repeaters.

If you'd like to participate in discussion about the podcast or about amateur radio, you can visit the Facebook group: https://www.facebook.com/groups/foundations.itmaze

This podcast episode was produced by Onno (VK6FLAB). You can find more at http://vk6flab.com/

One of my favourite activities is contesting. Essentially it's a time-limited activation of your station for the purposes of testing your skill and station against other participants. Contests are controlled by rules as varied as the amateur community itself.

That said, there are common terms and concepts and if you're not familiar with them, they can lead to confusion and disappointment when you inadvertently break a rule and see your hard work vanish into thin air.

I will note that what I'm discussing here is not universally true, so read the rules for each contest you participate in, something you should already be doing since rules are refined over time and it's rare to keep the same rules between years.

A contest starts and stops at a specific time, often expressed in UTC, or Universal Coordinated Time. You should know what your local time zone is in relation to UTC and take into account any variations like Summer and Winter time. Any contacts made outside these times don't count and you cannot log these against the contest.

Each contact or QSO is awarded a set number of points. It might be scored based on mode, band, power, time and sometimes distance. To encourage specific types of contacts, some might attract a score of zero. This does not mean that the contact is useless, which I'll get to shortly.

Your score is the sum of all the points you make for each contact. I will mention that contest logging software can track this to make your life easier, although it comes at the price of requiring a computer.

Sometimes a prohibited contact attracts penalties. Prohibited, as-in, by the rules of that contest. For example, some allow you to contact the same station more than once, others allow this only if you do it on a different band.

Speaking of bands. It's not permitted to make contest contacts on the WARC bands. In 1979, the World Administrative Radio Conference allocated the 30m, 17m and 12m bands for amateur use. These are not used for contesting. To avoid a contest, you can use those bands, but truth be told, you should try to use all the bands, even during contests, since it will help you operate your station in adverse conditions, something worth practising.

Many contests allocate additional scoring based on state, country, DXCC entity, CQ or ITU zone, prefix, or all of these together.

Both the CQ and ITU zones represent regions of the world. The CQ zones are managed by CQ Magazine and the ITU zones are managed by the International Telecommunications Union. A zone is represented by a number.

The DXCC is a system that tracks individual countries across the globe. If you make contact with 100

of these places, you've achieved your DX Century and you join the DX Century Club, or DXCC.

Consider a contact with me. You'd have a contact with VK6FLAB. It would also be a contact with the VK6 prefix, the VK DXCC entity, CQ zone 29 and ITU zone 58. If that's not enough, it would also be a contact with OC-001, the IOTA or Islands On The Air designation for Australia.

This is useful because for some contests these extra features represent points, often significant ones, generally referred to as a "multiplier".

To calculate your score, tally up all your contact points, then count all the features, CQ Zones, the ITU Zones, DXCC entities, states, countries, etc. and multiply your score with that count. If you contact 10 callsigns and get one point for each, you have 10 points. If in doing so you contact five contest features, you end up with an overall score of 50 points.

Often contests have different categories and rules for transmitter power level, the number of transmitters and the number of operators.

Definitions for these vary. High Power might be 400 Watts in Australia, but 1500 Watts in the United States. QRP or very low power might be 10 Watts in one contest, but 5 in another, so check.

Some contests have an assisted category where you're permitted to use tools like the DX Cluster where other stations alert you online to their presence on a particular frequency.

There is a concept of an overlay, where how long you've held your license, your age, working portable, battery operated, using a wire antenna or mobile, groups you with others doing the same thing. This means that you could be a rookie, youth, portable, battery, wire antenna, single assisted operator, all at the same time. It often pays to consider who else is in a particular group and make your claims accordingly.

If you're contesting with more than one person, a Multi station, there are rules for that too. Sometimes this includes the amount of land a contest station is permitted to use.

If you're a Multi-Single station, you might be permitted to use one transmitted signal on one band during any 10 minute period.

A Multi-Two might be permitted to use two simultaneous transmitted signals, but they must be on two different bands.

A Multi-Multi may activate all six contest bands at the same time, but only use one transmitter per band.

Some contests have a Short Wave Listener or SWL category, where you log all stations heard. There is also the concept of a check-log, where you log all your contacts, submit them, but don't enter the contest itself. You might have worked stations during the contest, but not according to the rules, because you might be aiming to get your DXCC. Submitting your log will help the contest organisers check other entries and validate the scores of the stations you contacted.

This might all be daunting, but if you read the rules of a contest and you're not sure, every contest manager I've ever spoken to is more than happy to help you understand what's allowed and what isn't.

One tip. Contesting is as much about the rules that are written as it is about the rules that are not. If you find a gap in the rules, and it doesn't go against the spirit of the contest, you're absolutely encouraged to use that to your advantage. If you do, you'll quickly discover why the rules change so often.

Preparation is everything!

~ I'm Onno VKFLAB

KB6NU's Column

Dan Romanchik, KB6NU

VK5DR, Codec 2 developer, wins 2022 Amateur Radio Software Award

Little known fact: I gave the ARSA committee the idea for this logo.

Earlier this week, the Amateur Radio Software Award (ARSA) committee selected David Rowe, VK5DGR, and his project, Codec 2, to receive the 3rd annual Amateur Radio Software Award. The award recognizes projects and their developers for technical innovation, impacts on amateur radio and community involvement. The award includes a $300 grant.

Codec 2 is a foundational project for digital voice communication on HF and VHF. It provides a royalty-free and open source codec suitable for digital voice application in amateur radio. Codec 2 enables other software and hardware projects to utilize digital voice communication without the barriers of licensing, usage fees and vendor lockdown.

In describing the project, Rowe said, "As well as speech compression software, the Codec 2 library also includes a variety of modems integrated into the FreeDV protocol to support robust open source digital voice over HF radio. We are working on improving the quality, and lowering the SNR required for HF digital voice."

With Codec 2, David has made significant contributions to amateur radio by helping to move the community beyond the vendor controlled digital voice ecosystem and enabling other innovation previously prevented by patents. David Rowe and key contributor Mooneer Salem, K6AQ, created FreeDV, a program for digital voice communication over HF, as a reference implementation. Codec 2 is also used by the M17 team for digital voice in their VHF/UHF/GigaHertz communication protocol and applications.

About the Award

The Amateur Radio Software Award is an annual award and is intended to recognize software projects that enhance amateur radio. It aims to promote amateur radio software development that adheres to the same spirit as amateur radio itself: innovative, free, and open.

The ARSA committee is solely responsible for determining the winner of the award. The committee this year included:

- Claus Niesen, AE0S (since 2020)
- Kun Lin, N7DMR (since 2020)
- Rich Gordon, K0EB (since 2021)

For more information about the award, visit the ARSA website.

Special Event Station

ARSA is sponsoring special event stations K3A, K3R, and K3S from Friday, August 26th through sunday September 5th, 2022 to promote innovative, free, and open amateur radio software.

During the event, we will honor the 2022 award recipient. As part of the special event, we encourage people to submit nominations for the 2023 Amateur Radio Software Award.

~ *Dan KB6NU*

When he's not trying to figure out which way current flows, Dan blogs about amateur radio at KB6NU.com, teaches ham radio classes, and operates CW on the HF bands. Look for him on 30m, 40m, and 80m. You can email him at cwgeek@kb6nu.com.

Amateur radio video: Six-year-old ham on David Letterman

Young ham on David Letterman

Veronica Harrington, KC6TQR, appeared on March 26, 1992. She was six years old at the time. David Letterman actually had a ham license at one point.

Click on the video or this link: https://youtu.be/8XGb1d8sjco

~ *Dan KB6NU*

There was a follow-up video from Veronica in 2009: https://youtu.be/rJVaWxFpPSE and she is still licensed.

Ham Leftovers...

Icom 7300 and 9700 Hidden Feature

A hidden feature of using your mic up/down buttons to trigger TX memories. https://youtu.be/S-m7T_-bCYU

Stealth guide for antenna restricted housing

If you live in a residence that prohibits external antennas, then these guides to stealth antennas will be very useful for you: https://www.hamfesters.org/main/wp-content/uploads/2012/07/Stealth-Antenna-Guide.pdf and http://www.bvarc.org/pdf/HF_Antennas_by_KD5FX.pdf

How to add an external spectrum/waterfall display to the iCom 7300

The default Spectrum & Waterfall settings for the IC-7300are quite acceptable but there are a few alternatives if you prefer to see it on a larger monitor. I use N1MM+ to put the waterfall on the monitor where I log my contacts, but here are some other options: http://adarc.co.uk/pdf/IC7300ExtDisplay.pdf

Do earthquakes change radio propagation?

Alex VE7DXW, who is studying the relationship between earthquakes and propagation writes:

"Recently, a paper was released by a team of scientists that included Phil Erickson. The paper explains the changes the Tonga eruption had on the Ionosphere. It not only created a huge plume of ash that had an effect, but also it was a seismic event that was picked up by the USGS as well as the RF-Seismograph! It lasted for days! The paper is at https://www.essoar.org/doi/abs/10.1002/essoar.10510445.1"

Wind-up tape measure transformed into portable antenna

If there's one thing that amateur radio operators are good at, it's turning just about anything into an antenna. And hams have a long history of portable operations, too, where they drag a (sometimes) minimalist setup of gear into the woods and set up shop to bag some contacts. Getting the two together, as with this field-portable antenna made from a tape measure, is a double win in any ham's book. The article is at: https://hackaday.com/2022/03/30/wind-up-tape-measure-transformed-into-portable-ham-antenna/

More Ham

Radio amateur who co-invented Ethernet SK

The radio amateur who co-developed the Ethernet, David Boggs WA3DBJ, has passed away at the age of 71.

The Engadet story says:

Pioneering Xerox PARC computer researcher David Boggs has died at 71, The New York Times has reported. He was best known for co-inventing the Ethernet PC connection standard used to link PCs in close proximity to other computers, printers and the internet — over both wired and wireless connections.

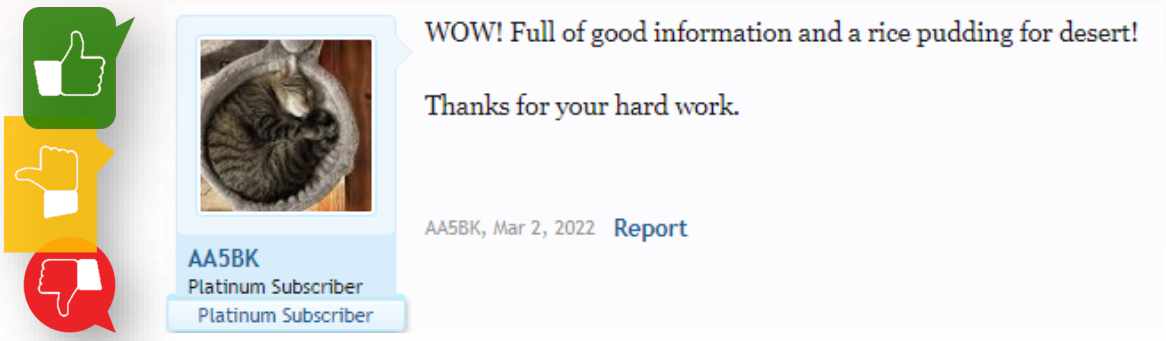
The Xerox PARC research lab in Palo Alto developed much of the PC tech we take for granted today like the graphic user interface, mouse and word processor. Boggs joined the team in 1973, and started working with fellow researcher Bob Metcalfe on a system to send information to and from the lab's computer.

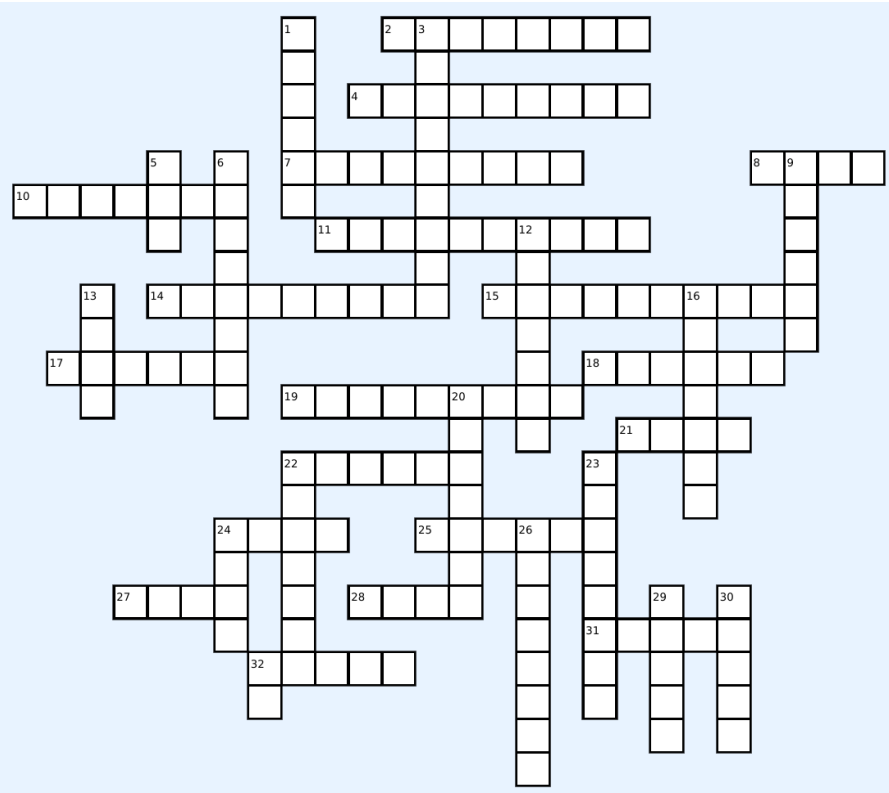
In about two years, they had designed the first version of Ethernet, a link that could transmit data at 2.94 Mbps over a coaxial cable. It borrowed in part from a wireless networking system developed at the University of Hawaii called ALOHAnet, tapping into Boggs' passion for HAM radio. "He was the perfect partner for me," Metcalfe told the NYT. “I was more of a concept artist, and he was a build-the-hardware-in-the-back-room engineer.”

Read the full story at

https://www.engadget.com/ethernet-co-inventor-david-boggs-dies-at-71-110524422.html

~ *Southgate*





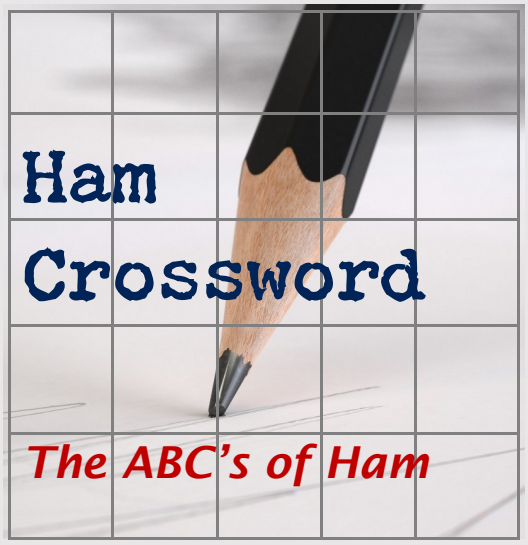
Across:

2. a unique identifier for each radio amateur and licensed radio station throughout the world
4. a passive electronic component composed of two conducting plates separated by a dielectric.
7. the height of a wave from the average or median position.
8. a ham station that has a fixed location
10. a device to either radiate radio signals or receive them from a station.
11. the reciprocal of the impedance of a component in a series or parallel tuned circuit.
14. the old name for a capacitor
15. a resistive device to reduce the amplitude or power of a signal.
17. a signal produced within a radio, typically by its microprocessor or circuitry, that appears at specific intervals across the tuning dial of a receiver
18. a very narrow RF filter used to pass one single frequency
19. a material electricity flows in easily
21. the rate of transmission
22. a PSK mode that allows full-duplex communications
24. the material used in the centre of an inductor coil
25. a station that transmits signals either continuously or on a timed basis, for location and propagation purposes
27. a slang term for an amateur or a communications satellite
28. a _____ frequency oscillator that is mixed with an incoming signal at the detector to produce an Audio Frequency tone for CW reception
31. a specialized form of RTTY protocol
32. modulation distortion caused by two or more carriers interfering with each other

Down:

1. an organization set up to process QSL cards between amateurs
3. a device that is used to increase voltage, current or power
5. the push-and-turn locking coaxial connector commonly used with VHF/UHF transceivers, and some test equipment
6. a feedline describing parallel conductors at equal and opposite potentials
9. the unit used for measurement of current
12. the transceiver circuitry used in voice-operated stations to prevent audio from the receiver's speaker from actuating the voice-operated transmitter.
13. a standard specification for the format of exported logbook files
16. the horizontal direction (angle) measured clockwise from north
20. the flow of electricity through a conductor usually associated with electron movement
23. the range of frequencies that this filter allows to pass
26. a method of polarizing the antenna such that the emitted electric field rotates around the axis of the antenna
29. a sub-audible tone that is frequently used on repeaters
30. Amateur Radio on the International Space Station

Solution on page 111



Radio Amateurs of Canada

ISED releases updated policy on Amateur Radio and examinations

On March 22, 2022, Innovation, Science and Economic Development Canada (ISED) released updated versions of two important policy documents: RIC-1 – Guide for Examiners Accredited to Conduct Examinations for Amateur Radio Operator Certificates and RIC-3 – Information on the Amateur Radio Service.

Both documents were updated to reflect the changes made to the Radiocommunication Regulations, specifically the rescinded ISED $20 examination fee for Amateur Radio Operator Certificates and the removal of certificates that are no longer issued by ISED. Other revisions include "editorial corrections for clarity" and the conversion to electronic format of the form to apply to become an Accredited Examiner.

Comments and suggestions may be directed to the following address:

Innovation, Science and Economic Development Canada

Spectrum Management Operations Branch

235 Queen Street Ottawa ON K1A 0H5

You can find the updated documents at these links:

English:

RIC-1: https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01007.html

RIC-3: https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01008.html

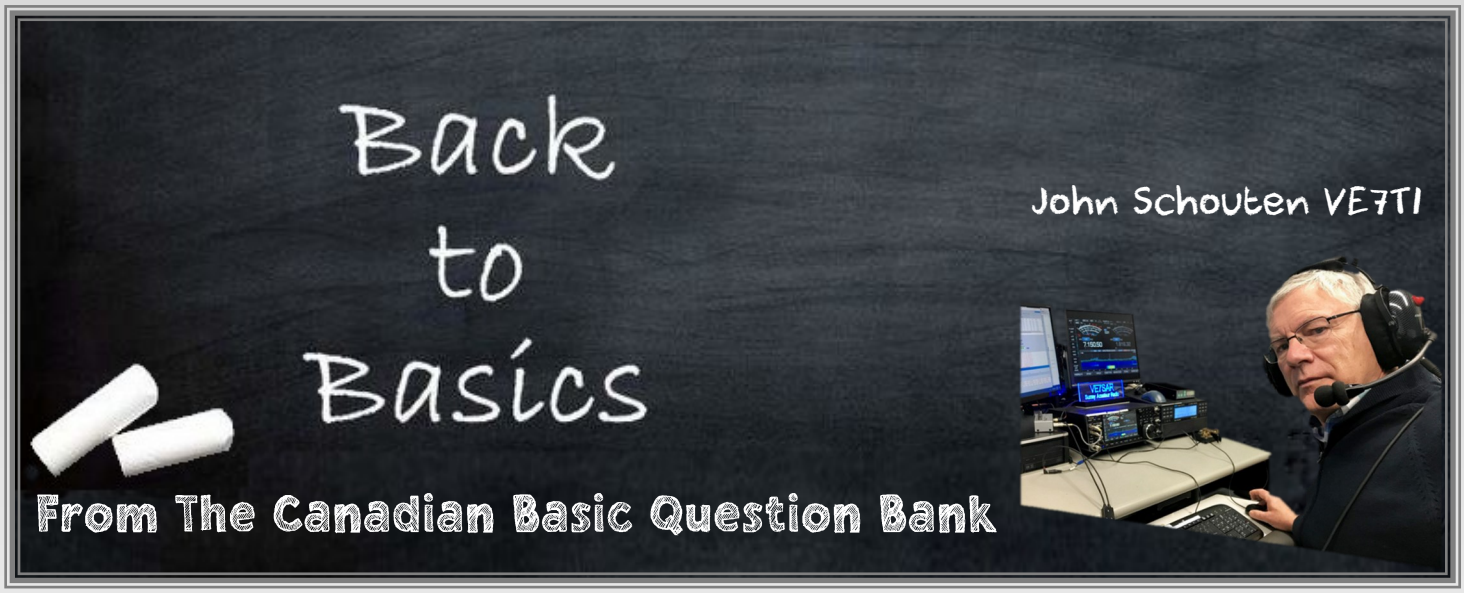
French

RIC-1: https://www.ic.gc.ca/eic/site/smt-gst.nsf/fra/sf01007.html

RIC-3: https://www.ic.gc.ca/eic/site/smt-gst.nsf/fra/sf01008.html

~

the May-June 2022 issue of The Canadian Amateur, the electronic TCA (eTCA) version of the magazine is now available for viewing or download for RAC members.



More on multimeters—Part 2

Last month we looked at multimeter types. Multimeters have the ability to measure voltage, current and resistance and more expensive models may add other functions such as temperature. A basic addition to your household tool kit, there are low cost multimeters available, frequently on sale for less than $15. I'd suggest purchasing a digital rather than analog model as a digital meter is easier to use and will suffice for basic measurements.

Digital models are generally "auto-ranging", a useful feature because you don't need to change the dial to measure different levels. If you think you might be using it in low light, consider getting one with a "back-light."

The first rule for getting the most out of your multimeter is to read the manual. The manual will have instructions for basic operation of the instrument and safety information about potential dangers. Once you have read the manual, added the batteries, and attached the probes (the wires, which are usually red and black), try some of the example measurements below.

Basic Multimeter Tests

Resistance Test

Set the multimeter to read "resistance." Check that the two probes are inserted in the correct holes.

What does the readout say when the probes are not touching anything? When the two probes are separated, there is an infinite resistance separating them, since air does not conduct electricity. Make a mental note of your multimeter's readout for infinite resistance, because it varies with the manufacturer.

Touch the two probes together. Now what does the readout say? When you touch the two probes together, the resistance is close to zero. The metal tips are excellent conductors and the wires offer little resistance to current flow.

Try this… I first did this as a science fair project. Set the knob to the highest Resistance scale on the meter Dampen two fingers and press one probe to each fingertip. Do you get a reading? With dry fingers you probably won't get a reading. Dry skin has a resistance of about 1 million ohms, whereas the resistance of moist skin is reduced by a factor of ten or more.

Try it with different liquids including salt or soapy water. Did the resistance change? What you are seeing is a Polygraph (lie detector) in its simplest form. As the subject is stressed from telling an untruth, the body produces perspiration which changes the skin's resistance [scientifically known as Galvanic Skin Response]. Also measured in a professional instrument are blood pressure, pulse and respiration. Once calibrated, a polygraph and trained operator can record and interpret the readings to determine when the subject is truthful or not. For more experimentation check Google.

Measure the resistance of some resistors that are not attached to a circuit. For example, test resistors of 100 Ω (ohms), 10,000 Ω, and 1 MΩ (megaohm, or 1 million ohms). You can buy these online or at a local supplier. Touch the probes to the wires on either side of the central cylinder. Watch the units: a "k" means kilo-ohms (thousands of ohms), and an "M" means megaohms (millions of ohms).

Never measure resistance in a circuit when power is applied. You must also discharge capacitors in a circuit before measuring resistance, because if there is any source of current other than the multimeter itself, you will get erroneous readings and possibly damage the instrument.

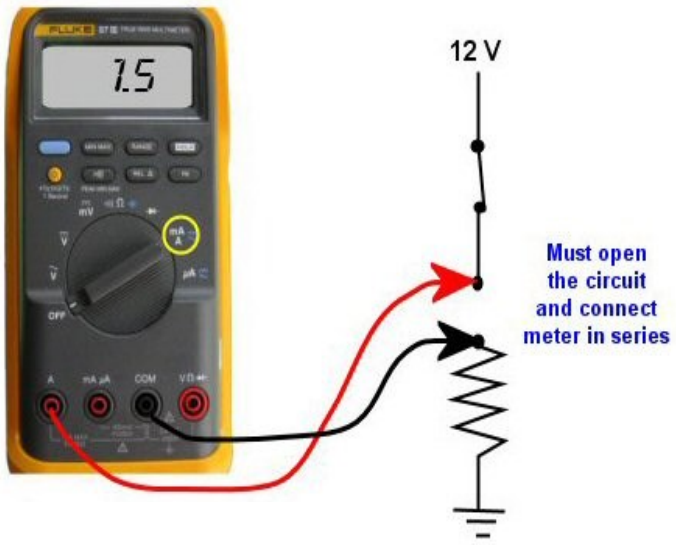
Voltage Test

Touch the probes to the terminal ends of a 9-V battery *[see photo]*. You should get a reading of approximately 9 Volts. This one reads 7.57V so it is obviously spent. The battery has a positive [red] and a negative [black] pole. Note that your multimeter also has a positive and a negative probe. If you attach the positive probe to the negative side of the battery, it will still read voltage, but it will have a negative sign in front of it.

Current Test

This is probably the trickiest reading to make and one that can damage the meter should you pass too much current through it. Set the multimeter to read "direct current (DC)." Important: Check your multimeter to see where the probe should be plugged in so it reads "current/amperage."

In order to measure current, you have to open up the circuit and attach the leads from the multimeter so that the current flows through the multimeter in series. To do this, use jumper wires and wires with alligator clips to add the multimeter to the circuit.



This Ham's OPINION

John Brodie VA7XB

Is a boycott of Russian Hams appropriate?

Ham radio is traditionally non-political. What possible purpose could such a boycott serve?

In the late 1950s, nuclear war with Russia was a distinct possibility when the Soviets moved ICBMs into Cuba ending in a face-off between Khruschev and Kennedy. As a new ham in 1960 at age 15, my very first DX contact was with UA0KFM on Sakhalin Island, Russia. It was an exciting moment and I had many more Russian contacts after that as I continued to enjoy the hobby and expand my horizons. Yet this was the time of the Cold War with the Soviet Union which began at the end of WW2 and continued for over 4 decades until the Soviet Union collapsed in 1992. Fear and disapproval of Russian aggression were wide-spread across the Western World.

Nevertheless, all during that time, amateur radio operators were able to communicate with hams in the Soviet Union and the Warsaw Pact countries. Yes, we were conscious of the subtle ideological value of the exchanges as displayed by Russian QSL cards which often came with propaganda messages. But we were never prohibited from amateur radio communications with these citizens of a repressive and bellicose regime. The mentality appears to have changed.

In a recent CQ WPX contest we noted the conspicuous absence of Russian stations. No surprise of course, given the contest organizers pronouncement on March 2022 that "in light of the invasion of Ukraine by Russia and Belarus, it will not accept competitive entries in any of its sponsored contests by amateur radio stations in Russia, Belarus or the separatist Donbas region of Ukraine …" The Radio Society of Great Britain took a similar stance, as have sports organizations banning Russian athletes from competing in international events. This is a disturbing trend, in my opinion, as it punishes innocent people whose only connection to the action is that they are citizens of the regime.

Ham radio is traditionally non-political. What possible purpose could such a boycott serve? Individual Russian citizens are not responsible for the actions of their political leaders. This, to be clear, is not a discussion about the morality or justification of the Russian invasion which the vast majority of us would condemn. It is about the questionable wisdom of a contest organizer meddling in politics to punish ordinary citizens for decisions over which they had no control or influence.

Opinions expressed here are not necessarily those of Surrey Amateur Radio Communications

What is next? Will Canadian hams be banned from a future international contest because a Russian contest organizer disapproves of Justin Trudeau's sanctions against Russian media and financial organizations, and his active support, furnishing of arms and military hardware to the Ukrainians? Why not, as the precedent has now been set? Just call it reciprocity or quid pro quo.

I did a bit of quick research and was not surprised by what I found. QRZ.com Forums published some candid opinions about the CQ WPX organizers' boycott decision. Here are a few:

"Looks like I will boycott CQ contests like I boycott the magazine they no longer print. This is stupid"

"I have some Russian blood, Ukrainian too. I'll avoid any CQ contests from now on"

"Punishing Yuri and Gorby achieves nothing and sets the precedent for others to follow when they decide to retaliate"

"If you were looking to drive the final nail into the coffin of the obviously struggling CQ business you may have done it with your decision…"

"Your position, like that of the RSGB, is being viewed as nothing more than politically correct grandstanding … Bad for your business and bad for amateur radio contesting"

I have searched Google to discover if ARRL or RAC have weighed in on this but found nothing. It may be appropriate for these two influential organizations to condemn this type of political meddling before the trend gathers more steam.

And, perhaps it's time to decide if SARC contesters wish to express disapproval of CQ's and RSGB's actions by boycotting future CQ & RSGB contests; because, as participants we indirectly give our tacit approval to their ill-considered decisions. You now know what I think. What do you think?

~ *John VA7XB*

408 SHORT WAVE & TELEVISION for DECEMBER, 1937

Ultra-Portable S-W Army Phone Set

This Month's Cover

The latest ultra-portable phone set for military use; it comprises a short-wave transmitter and receiver. H.R.H. The Princess Royal is shown inspecting this new type field radio equipment at Aldershot, England, during an inspection visit.

● SHORT WAVE and ultra-short-wave *portable* sets are being used to maintain contact between various groups of soldiers in many parts of the world at the present time. The accompanying picture shows an interesting two-way, ultra-portable battery transmitter and receiver being carried pack-aback, as used in the British army. The picture shows H.R.H. The Princess Royal, inspecting this new type of short wave transmitter-receiver at Aldershot, England, when she paid a visit of inspection to the Royal Signal Corps. The battery, tubes, coils and tuning condensers and other apparatus comprising the transmitter and receiver are housed in the small square box carried on the back. The aerial is enclosed in the semi-circular tubes at the top and bottom of the horizontal cabinet. The operation of switching from *transmit* to *receive* is carried out by means of a hand-operated switch-button mounted on the belt.

The American and other armies, have been quick to adapt short-wave sets operating on 60 mc. or 5 meters, and other similar frequencies, these sets being well adapted to the very compact construction necessary, and at the same time provide a range of 5 to 10 miles under good conditions; all with battery-operated tubes.

The previous models of portable army radio sets were generally equipped with hand-operated dynamos and while they were portable, it required several men to operate them, two of the men taking turns at spinning the dynamo with a hand-driven gear.

No matter in what part of the world one happens to inspect military radio equipment today, whether it is with the Japanese, or whether it is with one of the factions fighting in Spain, or again in the great army of the U.S.S.R., these ultra short-wave sets will be found plentifully sprinkled through the signal corps units.

As our front-cover picture shows, officers in advanced positions can today give orders rapidly "right on the spot" and often turn a bad military situation into a victorious one.

Calling all New Amateurs:
Get your Name in Lights!

Did you get your Amateur Radio certficate within the past year or two and want to introduce yourself through TCA to the Amateur Radio community? If so we would love to hear from you.

Drop a line to tcamag@yahoo.ca and tell us how you were introduced to the magic of Amateur Radio.

Do you credit any particular Amateur ("Elmer") with getting you started? Which aspect of the hobby do you enjoy so far?

Please be sure to include your name, call sign, date and level of certificate – and don't forget to include a photo or two. We hope to hear from you soon!

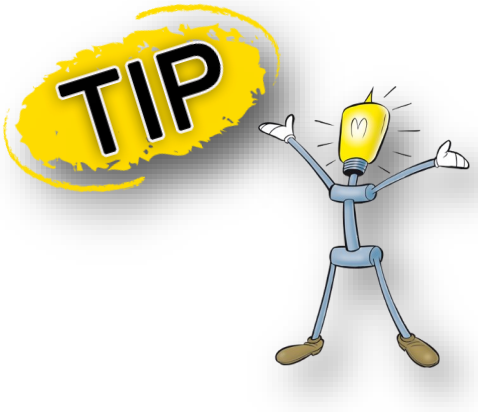
The current now flows from the 12 volt source through the switch, resistor and the multimeter because it is part of the circuit. Because it is connected in series, the meter can be inserted at any point in the circuit shown and show the same reading.

Don't be shy to experiment with your multimeter. You will likely find a multitude of uses for it around the house.

~ *John VE7TI*

Do you need more information about our courses?

https://bit.ly/SARCcourses or scan the QR-code with your smart-device camera



Study Links for more information

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:

1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. Industry Canada (ISED) on-line practice page: https://apc-cap.ic.gc.ca/pls/apc_anon/apeg_practice.practice_form
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/
5. VE3YT has an excellent question-based guide available at ve3yt.com

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year free as a SARC prospective member!

Newly Licensed? When you receive your paper license in the mail, it will come with a form that can be filled out and mailed to the Radio Amateurs of Canada office, at which point an introductory RAC one-year membership will be set up. Introductory memberships are identical to our existing basic memberships and you will receive The Canadian Amateur magazine for one year.

HAMpuzzle V1.2

Our new students are often confused by the block diagrams for receivers and transmitters. A freeware program to practice assembling block diagrams for the Canadian Amateur Radio Basic certification exam runs under Microsoft Windows (but also works flawlessly on Ubuntu 10.04 + Wine 1.2.2)

HAMpuzzle V1.2 (2014 04) https://www.rac.ca/wp-content/uploads/2014/04/HAMpuzzle/HAMpuzzle12.zip

Be sure to download at least one set of Diagrams from the web page and deposit the bank(s) in the same folder as the program. For Basic: https://www.rac.ca/wp-content/uploads/2014/04/HAMpuzzle/HAMpuzzle_Diag_Basic.zip

Radio Amateurs of Canada is pleased to make the HAMpuzzle© program available and extends sincere thanks and congratulations to François Daigneault, VE2AAY, for writing and providing it as freeware to anyone wishing to download it.

~ RAC

SARC Basic course feedback...

I'm from Vancouver, originally from Montreal. I have more interests than time, and in the background I'm silently judging myself for getting into what promises to be another fascinating and potentially expensive hobby. That said, full speed ahead!

As (barely) a teenager, a neighbour next door - incidentally I still remember he was VE2MZB - who took a liking to me mutually needed a small person to climb his tower and do some adjusting. I was game and more so, loving adventure, and after all the correct disclaimers and riders were signed and understood with my much-disapproving mother, up I went.

This being Montreal, essentially flat land, one could see for miles, literally, 50 feet above the ground. For this service I was gifted a WWII radio, a giant piece of steel-plate furniture which was removed from some battleship or other, in olive drab green.

He, my neighbour, advised me how to create an antenna, so twinned with the clothesline in the backyard of my parents' home appeared a thin stranded copper wire hung between two egg insulators with a shielded I think it was, basically, 16AWG in retrospect, wire.

The short version of this was many nights spent as a teenager listening to parts of the world which seemed much farther away than they today. This was the early 80s, and I was in the basement listening to Radio Free Europe, stations from all over Canada and the US, and broadcasts in languages I couldn't even begin to identify, and some I could but not understand their meaning still, the static, the Morse. An entire invisible world just waiting to be tuned in to.

I didn't mean to write an essay to you, but I hadn't realized how much I missed that experience until I took this stroll down memory lane, and so I'll leave it there and say that I'm very much looking forward to the course, getting licensed, and meeting people from the global community of radio enthusiasts.

More to your invitation to write, I enjoy BC's backcountry, aspire to hunt and am dabbling in land navigation, and am interested in preparedness and general service to my fellow humans, and amateur radio seems to tick all those boxes.

Thanks for offering this course online.

SURREY AMATEUR RADIO

basiccourse

OBTAIN YOUR FEDERAL AMATEUR RADIO CERTIFICATE

7-WEEKS · ON-LINE · $80

Next course starts June 13, 2022 — contact sarc@ve7sar.net

Includes classes, a comprehensive manual, videos and the exam fee

- Ideal for outdoors activities. Long range communications anywhere for free without commercial infrastructure
- Use satellite communication to speak around the world, perhaps even to an astronaut
- Participate in 'Radio Sports' like Contesting and Hidden Transmitter Hunts
- Enhance your personal and your community's preparedness in an emergency
- Use a radio, computer, smartphone or tablet for free worldwide voice and digital communications
- Practice an exciting hobby or start a career opportunity

City of Surrey
separ
Surrey Emergency Program Amateur Radio
https://separ.ca/

SARC
Surrey Amateur Radio Communications
http://ve7sar.net

SURREY AMATEUR RADIO

CW course

OBTAIN YOUR MORSE CODE ENDORSEMENT

8 WEEKS · THURSDAY · MAY 12 · 7-9PM · $30

For information contact sarc@ve7sar.net

Surrey Fire Service Training Centre • 14901—64 Avenue • Surrey

- CW is still around and is the lowest bandwidth mode. It's simple, reliable and allows signals to be received, even when propagation conditions are poor
- Enhance your personal and your community's preparedness in an emergency
- Open new amateur radio opportunities or improve your CW proficiency
- Work distant stations on less power with ultra-portable transceivers

Our proven course will teach you the easiest method to learn CW

City of Surrey separ
Surrey Emergency Program Amateur Radio
https://separ.ca/

SARC
Surrey Amateur Radio Communications
http://ve7sar.net

More information needed? Click: https://bit.ly/SARCcourses or use the QR code above

May 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 MRARC swap meet	2 On-line Basic Course 19:00 hrs	3 1930 SEPAR Net 2000 SARC Net	4	5	6	7 Coffee: 0700-0830 Denny's 6850 King George Blvd., Surrey SARC foxhunt 0900-Noon
8 Mother's Day	9 On-line Basic Course (Review) 19:00 hrs	10 On-line Basic Course (Exam @ OTC) 18:00 hrs 1930 SEPAR Net 2000 SARC Net	11 SARC General Meeting (Zoom) 1900-2100	12	13	14 Coffee: 0730-0930 Denny's OTC Open—10-Noon Contest: CQ M DX contest Canadian Prairies QSO Party t CW & SSB
15 Contest: CQ M DX contest Canadian Prairies QSO Party t CW & SSB	16	17 1930 SEPAR Net 2000 SARC Net Presentation on HFTA Terrain Analysis for Antenna Systems (see page 121)	18	19	20	21 Coffee: 0730-0930 Denny's OTC Open—10-Noon
22	23 Victoria Day	24 1930 SEPAR Net 2000 SARC Net	25 1900 SARC Exec Meeting	26 SEPAR Meeting	27	29 Coffee: 0730-0930 Denny's OTC Open—10-Noon Contest: CQ WPX (CW) Hyack Parade
29 Contest: CQ WPX (CW)	30	31 1930 SEPAR Net 2000 SARC Net				

For details on all SARC events, go to ve7sar.net

Contest Details: http://hornucopia.com/contestcal/contestcal.html

June 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		For details on all SARC events, go to ve7sar.net	1	2	3	4 Coffee: 0730-0930 Denny's 6850 King George Blvd., Surrey OTC Open: 10-Noon
5	6	7 1930 SEPAR Net 2000 SARC Net	8	9	10	11 Coffee: 0730-0930 Denny's OTC Open: 10-Noon
12 On-line Basic Course Intro 19:00 hrs	13 On-line Basic Course 19:00 hrs	14 SARC Annual General Meeting 1900-2100	15	16	17	18 Coffee: 0730-0930 Denny's OTC Open—10-Noon Party
19	20 On-line Basic Course 19:00 hrs	21 1930 SEPAR Net 2000 SARC Net	22	23 SEPAR Meeting	24	25 Coffee: 0730-0900 Denny's ARRL Field Day (all modes)
26 ARRL Field Day (all modes)	27 On-line Basic Course 19:00 hrs	28 1930 SEPAR Net 2000 SARC Net	29 1900 SARC Exec Meeting	30 30		

Contest Details: http://hornucopia.com/contestcal/contestcal.html

Local Ham Gear For Sale

More listings at hamshack.ca

For sale is a **Kenwood matching speaker** (blue-grey), model SP-70. The Kenwood SP-70 is a great addition to your TS-400 or the TS-700A series transceivers. It features a 4.75 inch speaker element and can handle up to 2.5 Watts. This 8 ohm speaker has a frequency response of 300 to 5000 Hz. The rear panel has screw terminals. Measures 6.5 x 4.875 x 7.875 inches 3 lbs
Asking $50

Contact: John VE7TI ve7ti@rac.ca

Upgrade your station!

LDG M-1000 tuner + accompanying SWR/Power meter

WANTED: **Old National Geographic and Reader's Digest Magazines.**

Contact: John VA7XB va7xb@rac.ca or 604-591-1825

HF Radio Transceiver

Kenwood 450SAT (built in antenna tuner) capable of 100W. It also has the YK88S Filter installed and the Voice Synthesizer option. There is a hand mic for the radio as well. Along with the radio there is the 20 amp Kenwood PS50 power supply. The radio typically sells for around $450-500 USD used, and the power supply 100-150 USD.

I am asking $500.00 for the pair.

Contact: Gord VA7GK va7gk@shaw.ca or 604-582-3983

Social Reminder

Subject to any COVID prevention policy in effect at the time, the Saturday weekly social gathering is once again 'on' at the Denny's Restaurant, 6850 King George Blvd., Surrey BC from 07:30—09:30. All are invited. Afterwards, we will host workshops, and our Elmers will be available to assist with questions or problems at the OTC, 5752—142 Street, Surrey from 10-noon.

Radio-Active

Profiles Of SARC Members

John Brodie VA7XB

John Hummell-Newell VE5JHN, a graduate of our Spring 2001 ham class, is one of SARC's newest and most enthusiastic members and a regular participant in on-line meetings. Although John now lives in Melfort, Saskatchewan, he was born and lived his early years in St. Stephen, New Brunswick. His mother was a nurse and his father a radio officer in the British Merchant Marine Service during WW2. John's interest in radio originated from his father's experience, and also with his family's Sunday tradition of tuning in to BBC World Service, Voice of America and other HF short wave stations.

When he was in High School, John purchased a Realistic DX-302 radio from Radio Shack introducing him to SSB, which his father taught him how to tune. Still living in NB in the early 1980s, he was a regular listener to the Hurricane Net which he used to track the course of storms originating on the Atlantic coast. Then around 1984 when the space shuttle program was active, he followed with great fascination the NASA live audio discussions between the astronauts and ground crews. All these experiences spawned an early interest in radio.

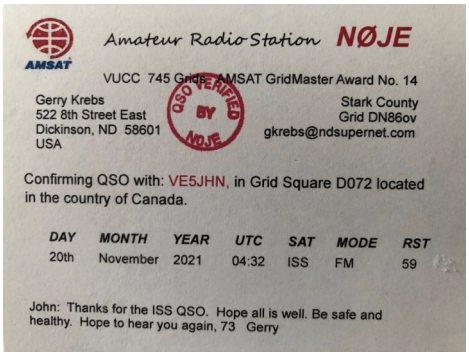
John has had a variety of occupations during his life. He started his career as a technician for a theatre school, then participated in a family business which involved making jewelry using flowers preserved in synthetic resin. Around 1992 he enrolled in a cooking course at New Brunswick Community College after which his first job was at the Algonquin, a CP Hotel in St. Andrews-by-the-Sea, NB. It was there he met his wife, Karen, and got married. He moved around after that, working as Manager of Food Services for the Northwest Company (historic competitor to Hudson's Bay Co.) in Baker Lake, NWT (now Nunavut). When 9-11 happened, it hit Baker Lake hard, because all air flights were grounded and nothing could be flown in or out.

Around 2011, John and his family including a son and daughter, moved back to NB, then in 2015 to Melfort, SK where he was employed in the fast food business before partially retiring. Sadly, his daughter was born with CP but John reflects that living in SK had its health care benefits as this is where Medicare began under the CCF government of Tommy Douglas.

John Hummell-Newell VE5JHN

SURREY AMATEUR RADIO COMMUNICATIONS

When COVID came along in 2020, to revive a life-long interest, John and his son purchased a web SDR and began exploring short wave and VHF, listening to ham club activities and nets, which is where he discovered SARC. At the encouragement of one ham, he found the ham class offered by SARC and enrolled. John remarks that he immediately felt comfortable with the instructors and he has "never felt so at home". He joined a CANVAS study group with a couple of other students which he describes as a most productive way to cement his understanding of the concepts. Upon completion of the course, he found an on-line examiner in Saskatoon, wrote the exam and achieved the excellent score of 87%.



The nearest ham club is in Saskatoon, with about 30 members, which allows John to converse with local hams through a nearby repeater. He owns a TYT UV88 handheld radio and a Xiegu HF radio for 160 to 10m plus a magnetic loop antenna. Most of his activity is on FT-8 but during the recent WPX SSB contest he was pleased to make several voice contacts into the US using the loop. Nearby power lines preclude his erecting a more effective HF antenna. However, John has succeeded in making a VHF contact using only 5 w of power with N. Dakota via the ISS repeater and is currently experimenting with SSTV.

John notes that the 2 recent SARC presentations of most interest to him were the Meerkat Space Telescope project and Parks-on-the-Air, the latter of which has particularly stimulated his interest as it is an activity he intends to join while camping this coming summer. We look forward to hearing more about John's new foray into amateur radio from Saskatchewan.

~ John VA7XB

A SARC Basic course update…

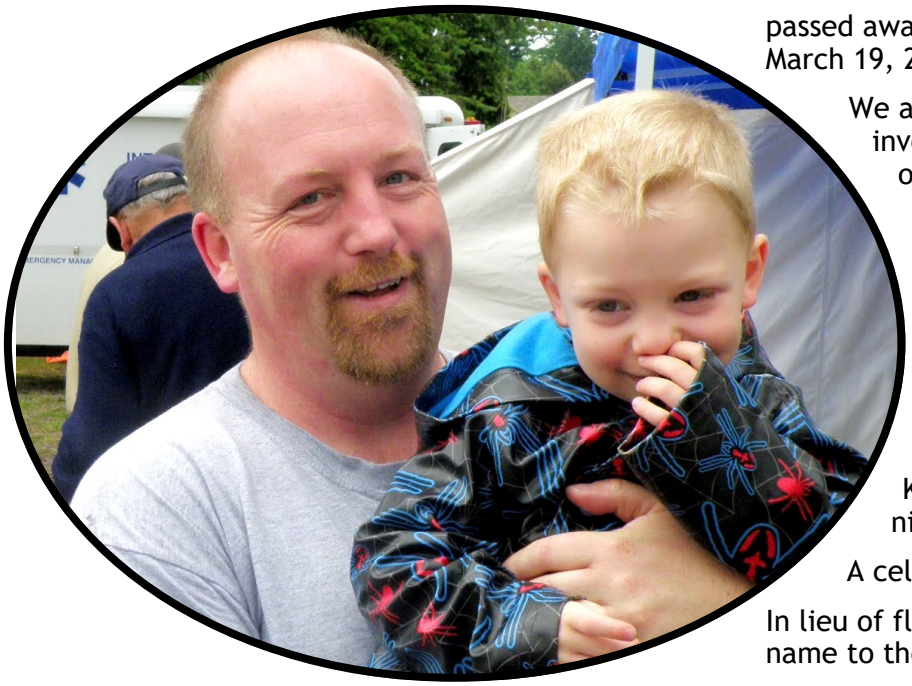
We have almost completed another SARC/SEPAR Basic Amateur Radio on-line course this week. The students write their exam after the course review on May 9th. This was another large turnout with students from well outside the Greater Vancouver area, including several students unable to take local courses because they live in remote areas.

The instructors do not get much respite however. Even as the March class started, we had a waiting list for our next class, which is now scheduled to start on June 13th. We are also returning to the classroom for a CW class on May 12th, and hopefully for a Basic course in September..

My thanks to fellow instructors Stan Williams VA7NF and Kevin McQuiggin VE7ZD, and of course our course administrator John Brodie VA7XB.

~ John VE7TI

Friends remembered...



David Paul Easingwood VE7DPE

passed away peacefully in the early morning of March 19, 2022.

We are saddened to lose Dave. He was involved with various groups and organizations, and was associated with SARC and our joint Field Days a decade ago. He was a valuable long-term member of the Langley Amateur Radio Association and the Langley Emergency program.

David is remembered as a kind man, who will be much missed. He is survived by his former wife Cheryl, son Keegan, mother Joy, sister Muriel and nieces Olivia & Natasha.

A celebration of life was held on April 30th.

In lieu of flowers, donations can be made in his name to the Heart & Stroke foundation.

https://www.seapac.org/

SEA-PAC WAVES

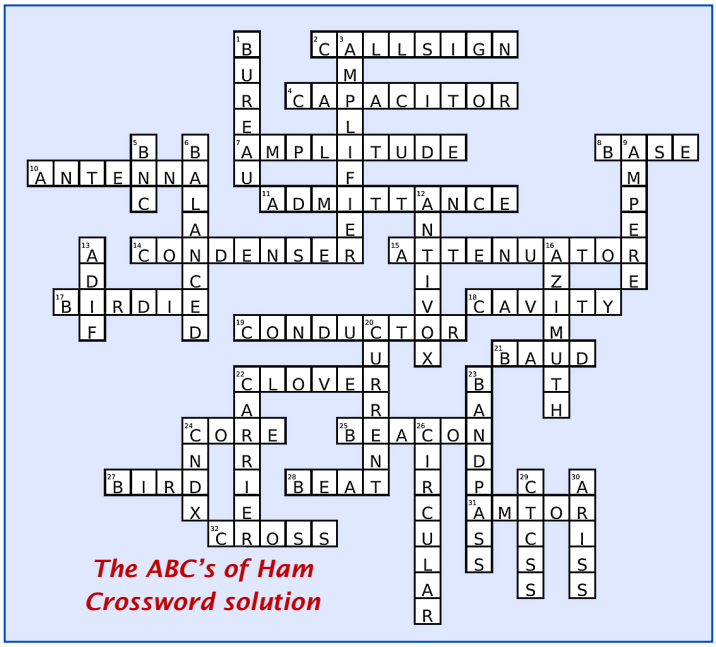
The Pacific Northwest's Largest Amateur Radio Convention

"Sand, Surf and Radios..."

Registration Online NOW For SEA-PAC 2022, June 3-5

To Register, go the SEA-PAC website and click on the "Register" tab on the left side of the homepage

- Registration is only online and in-person registration
  - Mail-in registration is longer available
  - You can register online through the SEA-PAC website or at the Registration Desk at the convention

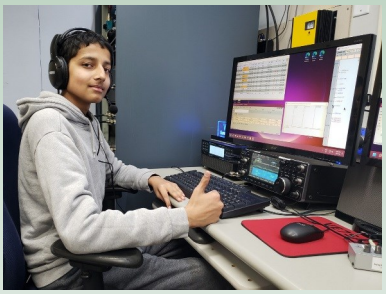


The ABC's of Ham Crossword solution

The Contest Contender
VE7SAR

John Brodie VA7XB

CQ WPX SSB contest



Thanks to those members (Jan VA7VJ, Steve VE7SXM, Sheldon VA7XH, Manvir VA7BKI, Andrew VA7LGN and John VA7XB) who participated as VE7SAR in making 538 Qs over the 2 days of this contest. Shown in the pics are new operators, Manvir and Andrew, who made their contesting debut and got up to speed quickly.

The team started off with a handicap on Friday and Saturday morning as the Internet was not working and therefore spots were unavailable until a faulty cable was located and repaired by Steve VE7SXM and Reg VA7ZEB.

Special thanks to Sheldon and John who helped out with the mentoring. Notable achievements were Jan's 220 contacts, Manvir's contact with Italy and Sheldon's contact with Kuwait. Regrettably, Russian stations were absent as a result of the contest organizers' political boycott.

~ *John VA7XB*

Home | Profile | Filter | View | Clear Filter | Breakdown | Clubs

M/S HP		Score	QSO
1	KA1ZD	6,010,062	2,370
2	ND3D	4,918,140	2,260
3	AF3K	4,756,269	3,350
4	KK4ODQ	1,268,892	1,150
5	WN7M	710,080	824
6	VE7SAR	413,224	538
7	N9TK	62,250	185
8	NW6P	61,504	171

CQWPXSSB 3/26/22 - Band by Operator Statistics

Band	VA7BKI	VA7LGN	VA7VJ	VA7XB	VA7XH	VE7SXM	Tot
7	0	0	0	13	4	0	17
14	17	0	198	38	66	23	342
21	3	31	22	1	86	35	178
28	0	0	0	0	1	0	1
Total	20	31	220	52	157	58	538

A call for contesters…

As part of a VE7SAR team or as individuals using their own callsign, SARC members have participated in many contests over the last few years from the OTC. Most of our equipment is state-of-the-art and improvements are being made continually so we can compete with the best.

Our more seasoned operators have been contesting for years, and they are using their experience to coach a few newbies. This is a fun and productive activity which will ensure that: a) the equipment is fully operating and ready to go; and b) operators know how to use it in the event of an emergency.

Invitation to participate in these contests has been hit and miss to date, so we need to compile a roster of potential contest operators for future events. I would request that members interested in honing their skills by contesting send me an email, stating:

a) Name, callsign and email address

b) Mode(s) of interest (e.g. CW, voice or digital - RTTY or other)

c) Experience level (e.g. proficient, moderate experience, or newbie needing coaching)

d) Particular contest type of interest (e.g. DX only, Field Day only, etc.)

e) Any limitations as to availability.

I will then use this roster to send invitations for upcoming contests.

Please send your feedback to JohnVA7XB@gmail.com.

~ *John VA7XB*

The ARRL DX SSB contest

This contest was held on March 5th at the OTC. Seven members (VA7XH VA7XB VE7TXL VE7TI VA7ZEB VE7SXM VA7ISI) took part, including two who had no prior experience.

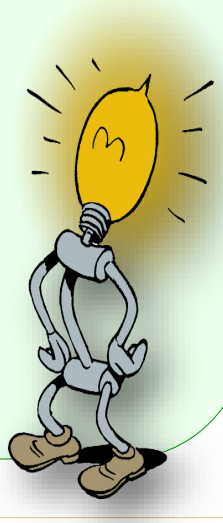
Home Profile Filter View Clear Filter Breakdown Clubs Teams Manual post

M/S HP		Score	QSO	States/Prov./Countrie
1	ZF1A	9,116,208	8,743	348
2	J68HZ	7,510,158	8,262	303
3	TM6M	4,299,453	4,963	289
4	CQ8M	3,517,908	4,132	284
5	ND7K	2,625,480	2,414	374
6	PT4A	2,524,716	3,492	241
7	N4SS	2,327,625	2,093	375
8	PY7ZC	2,102,016	3,129	224
9	SP8R	2,084,940	2,971	234
10	OK6Z	2,076,624	3,038	228
11	K1RX	1,726,503	1,649	349
12	W0GJ	1,206,672	1,093	368
13	W0ECC	1,006,506	1,026	327
14	HA3DX	719,304	1,394	172
15	HB9CC	408,945	995	137
16	F8KCF	220,500	588	125
17	VE7SAR	193,848	410	164
18	HB0A	171,414	642	89
19	NW6P	128,325	295	145
20	SC3A	81,168	304	89

We used high power and Europe was wide open during the morning and early afternoon. It was amazing to see how propagation has come up in this current solar cycle.

Our result was quite good as can be seen from the attached clip from the contest online scoreboard.

~



SURREY AMATEUR RADIO COMMUNICATIONS

Your SARC Membership

If you have not already renewed, your membership in SARC expires on May 31st.

You are requested to renew your membership prior to the next AGM, which is tentatively scheduled for Tuesday, June 14th. **(Please note this is a Tuesday!)**

Note that only those whose membership is in good standing may vote or be eligible to run for a Director's position.

Payment may be made in one of several ways:

1. Use PayPal on the SARC website: www.ve7sar.net
2. If we meet, bring a cheque or cash to the AGM
3. Mail a cheque to our Treasurer Scott Hawrelak 13935 80A Avenue, Surrey V3W 6P5

Dues are as follows:

- Individual $31
- Individual (if RAC member) $26
- Family $41
- Family (if RAC member) $36

Thankyou for taking care of this as soon as possible.

~ John Brodie VA7XB
Membership

Hamshack.ca

- Receives 12,000 or so visits per week
- Has over 500 registered users
- Usually sits at about 250 active listings as items seem to move very quickly

~ Don Rosberg, VE7DXE
250.380.8401

General Meeting Minutes

March 9, 2022
SARC General Meeting

Attendees: 34

Start Time: 7:01pm

Location: Online Zoom Meeting

Welcome and Call to Order - (Steve VE7SXM)

Steve welcomed everyone to the meeting and presented the agenda.

Review and Approval of Agenda - (Steve VE7SXM)

John Brodie moved that the agenda be approved. Gord K Seconded. Carried

Presentation

An "Ask an Elmer" session preceded the business meeting.

Announcements

April 13, 2022 - Next General Meeting

Fox Hunting (Les Tocko – VE7OM and Amel VA7KBA) with the presentation first and business meeting to follow.

Saturday Breakfast and OTC Open House

Saturday mornings 7:30am – 9:30am– Denny's Restaurant at 68th and KG Boulevard. 12 people turned out this past Saturday, and the restaurant was full, still requiring a passport, but no table limits.

OTC - 5756-142nd Street

- Open from 10am to 12pm Saturdays – Come check it out .
- Several (successful) exams were written this past Saturday.
- Basic Exams will be available this Saturday Mar 12th, 10am to 12pm at the OTC.

Financial Report (Scott H.)

A person has been found to help with the year end audit. We will be purchasing QuickBooks as a non profit and will be getting help setting this up for review.

Some issues were experienced with the Communicator payment buttons, now remedied by Jeremy/Scott. 2 people have subscribed for $5 annually already.

Committee Reports

SEPAR - (Gord - VA7GK)

- A few ham class students have joined after taking the basic course.

OTC - (Gord - VA7GK)

- Railing was damaged by someone backing into it. A request has been made to have it repaired by the city of Surrey.
- A concept for installing Bigfoot tower at the OTC was discussed.
- Work at the OTC is happening every Saturday.

SURREY AMATEUR RADIO COMMUNICATIONS

Membership - (John - VA7XB)

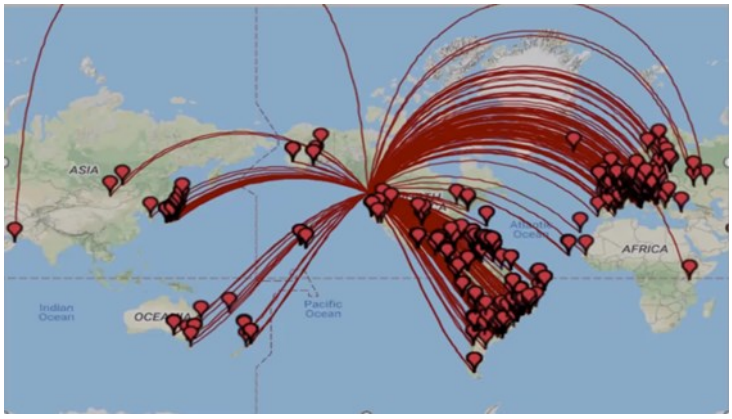
- Membership is at 111 now. Contact va7xb@rac.ca for the membership form if you've recently paid via PayPal.

Contests - (John - VA7XB)

VE7SAR Team has participated in:

- BC QSO Party early Feb 5-6
- ARRL International DX CW Feb 19-20
- ARRL International DX SSB March 5-6

During the SSB DX contest we made 400 contacts all over the world but 2000-3000 would be a winning score. We had fun but lots of room to improve our station and contest team.



1	4U1U	UN New York	1	26	HA	Hungary	2	51	P4	Aruba	4	76	YO	Romania	1
2	5Z	Kenya	1	27	HB9	Switzerland	2	52	PA	Netherlands	4	77	YU	Serbia	3
3	6W	Senegal	1	28	HC	Ecuador	6	53	PJ2	Curacao	5	78	YV	Venezuela	2
4	9A	Croatia	4	29	HH	Haiti	2	54	PJ4	Bonaire	5	79	ZF	Cayman Is	8
5	9Y	Trinidad and Tobago	2	30	HI	Dominican Republic	5	55	PY	Brazil	59	80	ZL	New Zealand	6
6	A4	Oman	1	31	HK	Colombia	5	56	PZ	Suriname	1	81	ZP	Paraguay	2
7	C6	The Bahamas	1	32	HL	South Korea	1	57	S5	Slovenia	8				
8	CE	Chile	16	33	I	Italy	12	58	SM	Sweden	3				
9	CO	Cuba	1	34	J6	Saint Lucia	4	59	SP	Poland	6				
10	CT	Portugal	1	35	JA	Japan	28	60	TA	Turkey AS	1				
11	CX	Uruguay	5	36	JT	Mongolia	1	61	TF	Iceland	1				
12	D4	Cape Verde	2	37	KH6	Hawaii	7	62	TG	Guatemala	1				
13	DL	Deutschland	7	38	KL7	Alaska	6	63	TI	Costa Rica	11				
14	E7	Bosnia and Herzegovina	1	39	KP2	Virgin Islands	3	64	UA	Russia EU	3				
15	EA	Spain	9	40	KP4	Puerto Rico	10	65	UA0	Russia AS	2				
16	EA8	Canary Islands	1	41	LU	Argentina	19	66	UA2	Kaliningrad	1				
17	EI	Ireland	4	42	LX	Luxembourg	1	66	UA2	Kaliningrad	1				
18	ES	Estonia	1	43	LZ	Bulgaria	1	67	V2	Antigua and Barbuda	3				
19	F	France	19	44	OA	Peru	5	68	V3	Belize	5				
20	FG	Guadeloupe	2	45	OE	Austria	1	69	VE	Canada	1				
21	FK	New Caledonia	1	46	OH	Finland	3	70	VK	Australia	7				
22	FS	Saint Martin	1	47	OK	Czech Rep.	4	71	VP5	Turks and Caicos Islands	3				
23	FY	French Guiana	3	48	OM	Slovakia	3	72	VP9	Bermuda	2				
24	G	England	6	49	ON	Belgium	4	73	W	USA	15				
25	GM	Scotland	1	50	OZ	Denmark	1	74	XE	Mexico	7				
								75	YL	Latvia	3				

Upcoming Contests:

- BARTG RTTY March 19-20
- CQ WW WPX SSB March 26-27

Nets - (John - VA7XB)

- We have a full list of operators including backups right now. Thanks Reg VA7ZEB for offering to be a backup. A decent antenna and radio able to reach the repeater are needed but a script is provided for control ops to follow.

Communicator - (John - VE7TI)

- Communicator went out last week at the end of the month and has been well received. Next edition has been started and as always John is looking for articles from the members of the club.

Ham Class (and exams) - (John - VE7TI)

- Last class finished a week ago and we are preparing for the next one starting March 21st. (may have some in class session if health orders allow). Some exams have been written so far with an average of 87%. About 40 signed up for the class starting March 21st with approx 2 per day being added.

Repeater Update/Status - (Steve - VE7SXM)

- Work on the South Repeater continues, including a relocation of the Fusion repeater to the North site, and looking for a backup in the south site.
- Gord: We have been offered a Motorola Quantar VHF 146-174Mhz Repeater. We can get the repeater for free but need to buy two 24V power supplies. Approx $195USD+ each power supply, one for ourselves and the other for the repeater donation. va7gk@shaw.ca

Old Business

- We have a new reviewed for the books. Thanks to those that reached out to help
- Generator Testing –power cords have been purchased for the OTC generator and the plan is to run some generator tests on an upcoming Saturday – weather permitting .
- Flex 6600 with Maestro Operation Training – Stan has offered to run a "drop-in " training sessions on the Flex 6600 – Saturday mornings 10am – 12pm. We would like to get more members using this radio
- We are still looking for an Electrician to assist in some rewiring of the generator output on Bigfoot
- OTC Internet access – testing Cellular options

New Projects List

- The board is working on a list of new projects and will share with membership along the way. The purpose of this process is to
- engage the membership early in the project process in order to gain greater input from the membership,
- provide better transparency in project spending
- garner assistance during implementation
- Purchase of ICOM 9700 VHF/UHF all mode radio for the OTC
- Expected cost to be approx. $2,100 plus tax
    - John S moved that we purchase an ICOM 9700 ~$2100+tax. Seconded by Stan W. Carried.

Call for other New Business

- Scott H. If anyone new to the club would like a SARC name badge for $10 please contact Scott or use the Paypal link for a $10 donation on the website and make the note for the name badge.

Next General Meeting

- April 13th, 2022 - General Meeting will be a presentation on Fox Hunting (Les Tocko – VE7OM and Amel)

Kevin moved to adjourn the meeting. Gord seconded. Carried

Meeting adjourned at 9 pm

~ Minutes prepared by Jeremy Morse VE7TMY

Twitter can make you famous!

...well at least for a couple of hours

We have had a VE7SAR Twitter account for many years but we probably post less often than most. However, we do try to use the platform for special events… such as Erika VA7ISI's debut on HF contesting.

Erika now holds the record for 'likes', formerly held by Stan VA7NF when he made an unlikely appearance on VHF phone.

General Meeting Minutes

April 2022
SARC General Meeting

Attendees: 35

Start Time: 7:05pm

Location: Online Zoom Meeting

The meeting was called to order by Steve VE7SXM at 1905.

Presentation

We started with a foxhunt presentation by Les Tocko VA7OM and Amel Krdzalic VA7KBA

Amel reviewed 80m foxhunts

- Gaining popularity, simple and easy to do, with no RF reflections
- No ham licence required, serves as an introduction to amateur radio for youth groups
- May elect to have a beacon running continuously, which allows participants to get to home location.

Les reviewed 2m foxhunts

- More challenging
- Europeans use AM receivers, North Americans use FM receivers
- Offset attenuator is necessary to get close to fox otherwise strong signals will overwhelm RX; should be housed in metal box for that reason
- Les is donating six 2m foxes plus beacon to SARC (thanks Les!)
- John VA7XB suggested the K0OV offset attenuator kit is available at the Offset Attenuator Project (homingin.com).
- Les suggests a club project to construct 2m attenuators

Review and Approval of Agenda

- Kevin McQuiggin moved to accept the agenda; seconded by Gord Kirk; carried.

Announcements

- Next General Meeting on May 11 will be Field Day Planning, hosted by Jason Biggin VA7ITJ. Field Day will be at the OTC this year on the 4th weekend of June.
- Saturday Mornings: Breakfast at Denny's 6850 King George Blvd is resuming 7:30-9:30 am Saturdays, followed by OTC activities between 10-12 Saturdays. Reg VA7ZEB suggested that those on the road at this time should check into the "Healthcare net" hosted by Gord Dick VE7FKY. John VE7TI noted that antenna workshops are scheduled for the next 3 Saturday mornings at the OTC and exams are also being conducted simultaneously.
- Hyack Parade: Gord VA7GK noted that Ken Clark VE7BC is calling for volunteers to help with communications at the parade on May 28th. Contact Ken if interested: kenjclarke@shaw.ca
- The Maple Ridge ARC swap meet is on May 1st and SARC has reserved a table to sell foxhunt TX & RX, also surplus club items;

members may wish to attend and sell personal items.

Financial Report

- Treasurer, Scott VA7HA , reported on our current financial situation.
- Cheques issued totaled $1161 for insurance, purchase of 220 radios and cables/hardware for roof antenna mount
- Scott is collecting names for another name tag order
- Scott is currently awaiting accounting software to change over the bookkeeping system

Committee Reports

SEPAR (Gord VA7GK)

- SEPAR volunteers will be requested to assist with the Hyack Parade on May 28th
- Volunteers are also needed to assist with an emergency preparedness seminar on May 7th organized by the City of Surrey
- Ion VE7ION is working on a Winlink node VE7ION-10
- Winlink node VE7MOV should be back in service shortly
- Gord is working on acquiring surplus computers for use in the trailer and Firehall 1
- SEPAR Society shutdown is in progress

Operations & Training Centre (Gord VA7GK)

- Roof and roof drain cleaning was undertaken last Saturday
- A Discone antenna has been installed on the roof for use with APRS
- The APRS project needs full Internet capability; Shaw and Telus are currently unable to provide a cable or fibre connection; Gord and Steve met with Surrey and the RCMP to resolve, but we currently have the limited version of Internet available by WI-FI connection to the former OTC building. Other cellular based options for Internet are being explored.
- The damaged railing has been repaired by Surrey
- Plans are being finalized for reorganizing the 12v power system in the radio room

Membership (John VA7XB)

- Membership is steady at 112

Contests (John VA7XB)

March 26 was the CQ WW WPX for SSB. 6 members participated, including 2 for the first time. Lots of good DX was available and conditions were good. Coming up are:

- April 16-17 CQ MM Contest for CW
- April 16-17 Ontario QSO Party
- May 14-15 CQ M DX contest CW & SSB
- May 14-15 Canadian Prairies QSO Party
- May 28-29 CQ WW WPX for CW

WA7BNM website lists contests available each weekend: WA7BNM Contest Calendar: Home. Think of contests as preparations for FD which is the biggest contest of all. Mentoring will be provided for any member who wants to give it a try.

Net (John VA7XB)

We currently have sufficient net control operators and backup.

Communicator (John VE7TI)

- Next Communicator, which will be out May 1st , is currently under preparation
- Contributions from members are sought
- Good feedback is being received from readers around the world

SURREY AMATEUR RADIO COMMUNICATIONS

Ham Classes (John VE7TI)

- Basic Class
  - The current class is now halfway through
  - Two students, though not yet completed the course, achieved 90% and 89% on the exam
  - An antenna workshop will be underway at the OTC on the next 3 Saturdays
  - The next basic class will commence June 13th with another to follow in September, at which time there will likely be both on-line and classroom
- CW Class
  - The CW class will start May 12 at the Fire Training Centre classroom continuing for 7-8 sessions
  - Former students can attend at no additional cost
  - Currently registered are 12 students, but up to 30 can be accommodated
  - Cristian requests to take on-line since he is away for 4 sessions (John XB to check with instructor)
  - Anton would like to register

Repeaters (Steve VE7SXM)

- Both repeaters appear to be working well, with minimal intermod interference
- South Site: Plan is to replace the old Master II repeater with new repeaters when available (soon)
- North Site: Yaesu Fusion repeater and Wires X will then be moved and made operational at the North site on UHF
- Andrew VE7LGN asked about getting IRLP on the South repeater. It is a lower priority for now

Old Business

- Stan VA7NF is offering drop-in training on the Flex 6600 on Saturday mornings
- Purchase of the Icom IC-9700 (Steve VE7SXM): awaiting purchase from Icom
- Bigfoot Tower (Steve VE7SXM): 110 v and 220 v power outlets will be installed on generator to allow supplementary use of generator for other than raising tower
- APRS (Reg VA7ZEB): Internet is the holdup so a cellular-based option is under investigation to overcome the limitation of current wireless option, which offers limited port access; an antenna has been installed on the roof. Bill VA7PFP will bring metal detector and Stan VA7NF will bring RF sniffer next Saturday, with objective to locate and trace underground copper cable (if it exists) between pre-school and OTC
- OTC 12v power (Steve VE7SXM): planning is underway to relocate batteries and upgrade power distribution
- Intermodulation Problem: Stan VA7NF is working on this
- Generator testing (Steve VE7SXM): will take place as soon as we have a good weather day
- Roof access (Reg VA7ZEB): Reg is concerned about safety with ladders; resolved to always have 2 persons present to steady ladder and assure good footing.
- Roof & drain cleaning: work was done last weekend and will continue as needed
- 220 radios (Gord VA7GK): radios will be available tomorrow
- AGM (Steve VE7SXM): scheduled for June 8th at the Fire Training Centre. 4 (of 8) Directors will be elected. A 25% quorum (or proxies) is needed. Date may have to be rescheduled if meeting room at Fire Training Centre is unavailable. NOTE: The date is now Tuesday, June 14th.
- Foxhunt (Anton VE7SSD): Jeremy (VE7TMY) and Thomas VE7TXL will deploy foxes. The main foxhunt will be 80m but a couple of 2m foxes will be set out for training purposes. Ralph VA7UB and Nell VA7PE have Foodsafe and will assist Stan VA7NF with cooking duties. John VA7XB will send out foxhunt notice this week.

The meeting was adjourned at 2100 hr.

~ Minutes prepared by John VA7XB

Presentation on HFTA Terrain Analysis for Antenna Systems

"HF Terrain Analysis of VE7SCC antenna systems and For Your Station"

The Coquitlam Amateur Radio Club (C.A.R.E.S.S.) will host a presentation of HFTA by Adrian VE7NZ on Tuesday, May 17th at 19:00 PDT.

This is open to all amateur radio operators.

Did you know your station's performance is dramatically affected by terrain up to 3km around you? Do you wonder if it would be worth investing in a taller tower? Do you think stations by the ocean get better results? Do you think a contest station works better on a mountaintop or on the prairies?

In this presentation, Adrian VE7NZ, will show you how to use ARRL's HFTA software to answer these questions and more. You will also be shown how to use HFTA software to profile your station.

Where: Remote via a Zoom Conference Call: https://zoom.us/j/6049689434 Passcode: [to be provided 1 day before event on the VE7SCC website: https://ve7scc.org/2022/04/presentation-high-frequency-terrain-assessment/.

The event will be live streamed on YouTube and will also be recorded and posted to YouTube after the event.

~

We welcome your comments and feedback

Please consider leaving a comment via email to communicator@ve7sar.net, or on our blog site https://ve7sar.blogspot.ca or, better yet, contact our authors directly, so they know someone is out there reading our publication.

SURREY AMATEUR RADIO COMMUNICATIONS

Another Great Meeting Presentation

Amateur radio direction finding (ARDF, also known as radio orienteering, radio fox hunting and radiosport) is an amateur radio sport that combines radio direction finding with the map and compass skills of orienteering. It is a timed race in which individual competitors use a topographic map, a magnetic compass and radio direction finding apparatus to navigate through diverse wooded terrain while searching for radio transmitters. The rules of the sport and international competitions are organized by the International Amateur Radio Union. The sport has been most popular in Eastern Europe, Russia, and China, where it was often used in the physical education programs in schools.

ARDF events use radio frequencies on either the two-meter or eighty-meter amateur radio bands. These two bands were chosen because of their universal availability to amateur radio licensees in all countries. The radio equipment carried by competitors on a course must be capable of receiving the signal being transmitted by the five transmitters and useful for radio direction finding, including a radio receiver, attenuator, and directional antenna. Most equipment designs integrate all three components into one handheld device. (See Wikipedia and HomingIn for additional details)

Receiver equipment

No radio license is required. The radio equipment carried on course must be capable of receiving the signal being transmitted by the transmitters and useful for radio direction finding. This includes a radio receiver that can tune in the specific frequency of transmission being used for the event, an attenuator or variable gain control, and a directional antenna. Directional antennas are more sensitive to radio signals arriving from some directions than others.

Most equipment designs integrate all three components into one handheld device. On the two meter band, the most common directional antennas used by competitors are

two or three element Yagi antennas made from flexible steel tape. This kind of antenna has a cardioid receiving pattern, which means that it has one peak direction where the received signal will be the strongest, and a null direction, 180° from the peak, in which the received signal will be the weakest. Flexible steel tape enables the antenna elements to flex and not break when encountering vegetation in the forest.

On the eighty meter band, two common receiver design approaches are to use either a small loop antenna or an even smaller loop antenna wound around a ferrite rod. These antennas have a bidirectional receiving pattern, with two peak directions 180° apart from one another and two null directions 180° apart from one another. The peak directions are 90° offset from the null directions. A small vertical antenna element can be combined with the loop or ferrite rod antenna to change the receiving pattern to a cardioid shape, but the resulting null in the cardioid is not as sensitive as the nulls in the bidirectional receiving pattern.

A switch is often used to allow the competitor to select the bidirectional or cardioid patterns at any moment.

This ARDF receiver equipment is designed to be lightweight and easy to operate while the competitor is in motion as well as rugged enough to withstand use in areas of thick vegetation.

Les Tocko VA7OM designed a top notch contest grade ARDF 80m receiver that is now available. Inquiries may be sent to VA7XB@rac.ca. Les and Amel presented a SARC meeting program on ARDF and the receiver in April 2022, following up on a presentation first given on March 11, 2020, when the receiver was still in development. The development team included his cohorts Amel Krdzalic VA7KBA and Dave Miller VE7HR. He has shared his presentation slides and two videos. Here are some links:

Les' Slides on ARDF (PDF 5Mb)

Les' ARDF Video: Fox Placement and Strategy

A video on the use of the new receiver

Our 2019 SARC FoxHunt video.

~

How to use the RX80m receiver.

Simple enough for a 6-year old…

Click on the box to see!

SURREY AMATEUR RADIO foxhunt

HIDDEN TRANSMITTER HUNT

no radio license needed

FREE EVENT · OPEN TO THE PUBLIC

SATURDAY MAY 7, 2022 at 9am

Crescent Park, South Surrey

Pre-hunt Coaching, Registration & Instruction 9am
FoxHunt 10am—Noon

For exact location scan the QR Code below

If you are a beginner and do not have an 80m receiver, come anyhow, we have loaner equipment, or we can team you up with someone experienced.

Talk-in 147.36+ (110.9 Tone)

All are welcome but we ask that you RSVP to jamesadf77@gmail.com

SARC
Surrey Amateur Radio Communications

80M ARDF Equipment

Always find the Source

80M Fox transmitter

Contact John for pricing and availability - JohnVA7XB@gmail.com
Cost CAD $99 + Shipping

The new ARDF fox is a highly configurable transmitter with the following features:

- Configurable using a serial terminal through the USB port on a PC
- Configurable call sign identification, CW speed and repetition frequency
- Adjustable fox number from 1 sending "MOE" to 5 sending "MO5"
- Configurable transmission modes
  - Standard (10wpm, on 1 min, off 4 min)
  - Alternate (10wpm, on 1 min, off 1 min)
  - Sprint (10wpm, on 12 s, off 48 s)
  - Fast sprint (15wpm, on 12 s, off 48 s)
- Beacon mode sending "MO" at 10wpm continuously
- Spectator mode sending "S" at 15wpm continuously
- Low battery mode sending MOx once every 5 minutes
- Start of event timer configurable up to 120 minutes
- Start button to synchronize multiple foxes
- Optional short pre-event transmissions one hour before the event start with configurable CW speed
- Flashing LED showing status
  - waiting to begin delayed start – rapid flashing
  - running – on continuously
  - CW transmissions – flashing with CW timing
- Debug mode providing progress reporting via the terminal

Frequency: 3.579 MHz

Range: 300 m

Long Range (1300m) factory option available at extra cost - Contact us

The TX80M manual is available at:
http://www.rx80m.com/resources/ARDF-TX-Instruction-Manual---1.003.pdf

SURREY EMERGENCY PROGRAM AMATEUR RADIO

SEPAR Report

A Spring 2022 update

Gord Kirk VA7GK
SEPAR Coordinator

Many of the local hams have been assisting in activities and projects which ultimately help and prepare the Amateur Radio Operators in Surrey and the surrounding areas to assist with communications should normal systems fail. We have a broad group of interests from digital modes, Linux fans, contesters, and experimenters to which we can add many newly licensed radio operators thanks to the regular offering of training classes through SARC.

With the Operations and Training Center (OTC) at the Volunteer Emergency Program Building we are able to meet weekly, learn, build and train.

At the OTC building the ongoing development of the station on site has been remarkable. Two high power HF positions and VHF/UHF also available. There has been considerable work on improving WIFI at the site to hopefully allow for remote station operation of the radios. Of course the physical site always needs attention and one of the biggest areas we have recognized is the roof. The nearby trees drop leaves which block the downspouts and leave standing water in deep pools on the roof. This means reopening the clogged drains and once the water is gone, blowing the material off the roof. The last time this was discovered as we were planning on installing a new roof top mast and discone antenna on one corner of the roof.

We also have a couple of new 220 mobile radios, so a 220Mhz antenna will also need to be built and mounted. The second 220mhz radio will be mounted in the SEPAR Trailer.

Back to the OTC there is also an ongoing project with the main tower antenna and grounding to help improve the efficiency of the antenna. Again, lots of learning and understanding is happening as a result. It is very encouraging to see when visiting a hams home QTH to see learnings from Saturday mornings being applied to improve signals and installation. As well, to hear improved signals during weekly nets is also very rewarding.

Each week we have been maintaining our weekly nets both as part of the emergency program and the SARC net as a social time. Some of the newly licensed operators have been taking a try and running the net.

SURREY EMERGENCY PROGRAM AMATEUR RADIO

Again, with minimal coaching and a well written script it is rewarding to see and hear these new hams stepping up and getting on the air. As we do have both 440 and 220 repeaters, as well as primary and secondary simplex frequencies that we use, it is time to expand the nets from 2m only, to also testing and trying our other frequencies. I encourage the local participants to look up the available SARC repeaters and to make sure you have them programmed into your radios so we can “switch over” to other bands as part of our weekly exercises.

Another sign that things are changing is an invitation made to SEPAR from the city to participate in a public demonstration in front of a local recreation facility . It is time to encourage residents to volunteer and take part in being prepared. SEPAR will set up the Trailer and grab and go Kits as part of the display.

This activity will again help us to focus on what we do and why. It should help us test some of the equipment and give an opportunity for some of the newer members to explain why they are involved and became licensed.

It is exciting to be able to get back out into our community and use our radios. I encourage everyone to be involved, develop a family communication plan and learn the local emergency program plan in your area. As an Amateur Radio operator your skills using your own equipment will be invaluable when something happens that takes away some of the normal communication methods.

As always please reach out if you have any questions or comments or if you would like to participate in the SEPAR program within Surrey.

If you are interested in the SEPAR program, and wish to become more involved, please let us know. Our website is www.separ.ca and there is a contact form to get in touch with us.

Name	Frequency	Offset	CTCSS
VE7RSC (Primary Repeater)	147.360	+0.600	110.9
VE7RSC (Secondary Repeater)	443.775	+5.0	110.9
VE7RPT (Primary Regional Repeater)	146.940	-0.600	Optional 136.5 Rcve
Simplex 1	(VHF) 146.550		
Simplex 2	(VHF) 147.420		
Simplex 3	(UHF) 446.550		
Simplex 4	(UHF) 447.425		

Other frequencies in the Greater Vancouver area:

Primary: Coquitlam/Abbotsford 146.430

Primary: Inter-Municipal Group 3 146.445

Primary: Vancouver; Mission; Sec. Coquitlam 146.460

Primary: Kent-Mission; Sec. Richmond 146.475

Primary: Inter-Municipal Group 2 146.490

Primary: New West; Sec. Richmond 146.505

National Calling / FM Simplex Group I 146.520

Primary: North Shore; Port Coquitlam 146.535

Primary: Bowen Island; Surrey 146.550

Intermunicipal Group 1 Coordination 146.565

Primary: Lions Bay/Vancouver/Delta/Langley 146.580

Primary: Port Moody; Sec: Burnaby 146.595

Secondary: Vancouver/Surrey 147.420

Secondary: Vancouver (UBC) / Maple Ridge 147.450

Primary: White Rock/Chilliwack; Sec. No. Shore 147.480

Secondary: Burnaby/Pitt Meadows 147.510

Primary: Delta; Sec: Abbottsford 147.540

Primary: Hope; Sec: Delta; ALSO EMBC 147.570

separ

Surrey Emergency Program Amateur Radio

SURREY EMERGENCY PROGRAM AMATEUR RADIO

Our weekly nets are every Tuesday night on the SARC repeater on 147.360 + T110.9 at 07:30 pm PST. All are welcome to check in.

IMERS Monthly Check-In

Once a month (the first Wednesday) SEPAR attends Fire Hall 1 Radio room and participates on behalf of the Fire (City) on checking into the Inter-Municipal Emergency Radio System. This is a short net which we check into, testing the radio. The time is between 10:45-11:30am each month. If you are interested in learning how this is done please let me know and we will get you trained in this.

Field Day

June 25-26 (Saturday and Sunday).

Work is underway to plan this years Field Day. More information to follow, please mark you calendars. Let me know if you can help volunteer to work on the event organization/ planning, setup, operation, teardown etc.

This is the largest radio event of the year and it would be great if you can help out.

SEPAR Website Members Area

The SEPAR Website has a members only area. If you do not have access and are a SEPAR member please let me know and we can add you to access this area.

The SEPAR website includes, photos, documents (net scripts etc.) as well as a calendar. The website is www.separ.ca

SEPAR Vests

If you have a SEPAR Vest can you please let me know. I will be following up with those who have been assigned a vest previously.

As always please reach out if you have any questions or comments or if you would like to participate in the SEPAR program within Surrey.

If you are interested in the SEPAR program, and wish to become more involved, please let us know. Our website is www.separ.ca and there is a contact form to get in touch with us.

Hyack Parade

The New Westminster Hyack International Parade is back! The date will be Saturday, May 28 after a hiatus due to COVID. Each year in New Westminster the Hyack Parade is held and assistance with communications is supported by the amateur radio community. This is an excellent opportunity to provide some community service and learn how event communications are done. You do not need to be an “experienced” operator to volunteer. A willingness to learn and a handheld radio with a charged battery is all that is needed.

Please let me know whether you will be able to help. May 28 seems like a long way off, but is less than 8 weeks away! I know how much the Hyack Association and the City of New Westminster appreciate our services.

As always, new hams are very welcome. No experience is necessary, we can certainly buddy up any brand new hams with an experienced operator.

~ Gord Kirk VA7GK
SEPAR Coordinator

We're QRT

John Brodie VA7XB

Visions, Values, Purpose, Objectives

The next AGM is around the corner and the executive will soon be wrestling with the question "Where is SARC Going?" In the lexicon of "strategic planning" the "Purpose" of our organization is intertwined with the related concepts of "mission, visions, values, goals and objectives". We can start the discussion by turning to our Constitution, which says our Purpose is:

- *To promote and encourage interest and activities associated with amateur radio*
- *To assist the Community in the event of an emergency or wherever communications may be required*

It may be an appropriate time to consider some specific objectives that will help us fulfill our constitutional Purpose. You may want to think about club objectives for SARC's 2022-2023 season and how they might support the Purpose as expressed by our Constitution. The benefit of having some specific objectives would appear to be self-evident with respect to our future success in promoting amateur radio, providing advancement to our members and service to the community. Objectives should be measurable, i.e. we should be able to know conclusively if we have achieved them or not.

Here is what one member had to say about the value of setting objectives: "Setting goals and objectives is a great motivator and keeps us from becoming apathetic and preventing stagnation, particularly if we also commit to reviewing our achievements, based on the goals we set, at the end of the year. Setting realistic goals also requires us to think about how we would achieve them, which would, hopefully, provide an opportunity to build teams and get commitments from an increasing number of Club members to participate and contribute. We may not meet our goals the first time, but at least it would be the start of a process that may well grow the Club in the longer term."

Following is a compilation of suggestions broken into general and measurable categories:

General Objectives

- Promote Amateur Radio - grow general interest in the hobby and knowledge of radio
- Encourage public service via Amateur Radio, especially given our bond with SEPAR
- Grow members' interest in HF, DX and contesting
- Collectively Elmer hams who need assistance to grow their knowledge and skills

SARC SOCIETY DIRECTORS 2020-2021

PRESIDENT
Steve Mclean VE7SXM
president at ve7sar.net

VICE PRESIDENT
John Brodie VA7XB
vicepresident at ve7sar.net

SECRETARY / WEBMASTER
Jeremy Morse VE7TMY
secretary at ve7sar.net

TREASURER
Scott Hawrelak VE7HA
treasurer at ve7sar.net

DIRECTORS

Gord Kirk VE7GK
(SEPAR Liaison)

Kevin McQuiggin VE7ZD / KN7Q

John Schouten VE7TI
(SARC Publications/Blog/Social Media & Courses)
communicator at ve7sar.net
course at ve7sar.net

Stan Williams VA7NF

SARC MEMBERSHIP, NET & CONTEST MANAGER
John Brodie VA7XB
membership at ve7sar.net

SARC QSL MANAGER
(pro tem) John Brodie VA7XB

SARC REPEATER MANAGER
VACANT
repeater at ve7sar.net

- Share our stations with hams who do not have the equipment, but want to gain experience
- Support Ham Radio classes
- Increased participation (not just membership)
- Obtain some positive publicity
- Organize programs that will assist members in improving their skills, broadening their field of knowledge, and expanding the horizons of their participation in Amateur Radio and in SARC.
- Continually improve the Field Day operation in all areas: provisioning, deployment, functionality, operations, participation, etc.

Measurable Objectives

Administrative

- Develop a clear mission statement for the Club, and our relationship with SEPAR. Formulate long-term goals, and develop both membership (internal) and public relations/marketing (external) plans for accomplishing those goals
- Create a manual reflecting the SARC's administrative function, documenting Executive roles, planning processes, schedules, tasks, methodologies, etc., packaged for ease of duplication and cross-training as members cycle through various roles

Repeaters

- Work with SEPAR to get BC WARN installed and fully functioning at the repeater and OTC sites.

Licensing/Training/Field Day

- License at least 30 new amateurs annually through the basic ham class
- Promote the operator skills training program so that we have 6 operators fully trained and ready to make a competitive impact at Field Day.
- Achieve one of the top 3 Canadian scores in any given contest
- Continue CW classes and bring the rusty or beginning CW operators up to 10 wpm by June, with the further objective of having them proficient to 25 wpm by Field Day 2023.

Please consider the above comments as the basis for discussion at a future meeting. If you have some specific contributions to the foregoing, we would appreciate hearing from you. In the meantime, the Executive will be working on distilling those objectives that would form the key part of a strategic plan for SARC.

~ John Brodie VA7XB
Vice-President SARC

A look back…

From The Communicator—June 2012

Field Day 2012 was just ahead… Here Fred VE7IO [foreground] and Jim VE7FO, plot Field Day strategy by checking predicted band conditions vs our operating bands.

May—June

Summer = Field day!

Lots coming up on our list of local events! First is our Fox Hunt on May 7th. You will find lots of information in this issue. Next is our monthly meeting on May 11th, and we will plan Field Day.

Heading into June, our Annual General Meeting is scheduled for Wednesday, June 8. Come and support SARC and have a say in our plans for the next year.

Then… the BIG one! Field Day, which we plan to have from the OTC on the weekend of June 24-25. Twenty-four hours of continuous operation, a test of our gear, and (hopefully) some great solar conditions to make it the best ever.

SARC hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

We are looking for a SARC Net Manager. Its not a difficult job and, if you have some time to spare, we'd like to hear from you. Basically it involves scheduling someone to do the Tuesday evening weekly net.

	SARC Net 20:00 Hrs
1st Tuesday Standby	Jean-Luc VA7JLU Reg VA7ZEB
2nd Tuesday Standby	Jinty VA7JMR Sheldon VA7XNL
3rd Tuesday Standby	Rob VE7CZV REG VA7ZEB
4th Tuesday Standby	Kapila VE7KGK John VA7XB
5th Tuesday Standby	Reg VA7ZEB John VE7TI
Want a turn at Net Control? Contact the SARC Net Manager	

Down The Log…

SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hrs at the Surrey Fire Service Training Centre, 14923 - 64 Avenue, Surrey, BC. Here is a what3words link and map: https://what3words.com/markers.addiction.ozone

Weekly SARC Social

COVID permitting, Saturday between 0730 and 0930 hrs at the Denny's Restaurant, 6850 King George Blvd., Surrey BC

Workshops

Saturday between 1000 and Noon at the OTC 5756 142 Street, Surrey BC

SEPAR Net

Tuesday at 1930 hrs local on 147.360 MHz (+) Tone=110.9

SARC Net

Tuesday at 2000 hrs local on 147.360 MHz (+) Tone=110.9

VE7RSC Repeaters

2m North: 147.360MHz+
Tone=110.9Hz
IRLP node 1736
Echolink node 496228

2m South: 147.360MHz+
Tone=103.5Hz Fusion capable; No IRLP/EchoLink

1.2m: 223.960 Mhz -1.6
Tone=110.9Hz

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737

We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for SARC.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.

We thank our sponsors for their support of SARC

Please support them.